Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Panini Kanya Maha Vidyalaya Collection.

Digitized by Arya Samaj Foundation Chennai and eGangotri

JNL. BOMBAY
NATURAL
HIST. SOC.

VOL. 21
1911

G. K. V.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

गुरुकुल कांगड़ी विश्वविद्यालय, हरिद्वार
पुस्तकालय

गुरुकुल कांगड़ी विश्वविद्यालय, हरिद्वार

R
विषय संख्या 590.5
पुस्तक संख्या B63J
V.21
आगत पंजिका संख्या 79545

पुस्तक पर किसी प्रकार का निशान लगाना वर्जित है। कृपया १५ दिन से अधिक समय तक पुस्तक अपने पास न रखें।

7954

GULZAR BOOK BINDING HOUSE

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

7954

यह पुस्तक वितरित न की जाय
NOT TO BE ISSUED

सन्दर्भ ग्रन्थ
REFRENCE BOOK

स्थायी संग्रहीकरण १९८४-१९८५

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

79524

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE.

VII. The Birth of a Wild Elephant Calf. By C. W. Allan, D.F.O. 239

VIII. Notes on the Gaur (*Bos gaurus*). By Aylmer F. Martin 241

IX. The Domestic Breeds of Indian Sheep. By H. J. Elwes..... 245

X. Weight and Measurements of a Serow. By Alex M. Primrose 246

XI. Weight and Measurements of a Goral. By Alex M. Primrose 247

XII. Strange Mortality amongst Black Buck (*Antilope cervicapra*). By Lt.-Col. G. H. Evans 247

XIII. Large Heads of Malay Sambar and Brow Antlered Deer. By H. J. Davis, F.G.S.... 248

XIV. Crow and its Food. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 248

XV. Notes relating to the Habits and Nidification of the Black-headed Sibia (*Lioptila capistrata*, Vigors). (*With 2 Text-figs.*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. ... 249

XVI. A New Bar-wing from Burma. By Major H. H. Harington..... 256

XVII. Curious behaviour of a Myna. By Lieut. F. B. Scott 256

XVIII. Notes on Birds round Rawal Pindi. By H. Whistler, Indian Police, and N. B. Kinnear 256

XIX. Notes on the Nidification of *Microcichla scouleri* (Vigors), the little Forktail. By P. T. L. Dodsworth, F.Z.S., M.B.O.U..... 257

XX. Nesting Notes from Lower Burma. By S. M. Robinson..... 261

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

XXI. Some winter visitors to Rawal Pindi. By H. Whistler, Indian Police 262

XXII. Seasonal movements of the Himalayan Greenfinch (*Hypacanthis spinoides*). By Capt. R. B. Skinner, R.E. 262

XXIII. Occurrence of *Hemilophus pulverulentus*, (Temm.) The Great Slaty Woodpecker, in the neighbourhood of Simla, N.-W. Himalayas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 263

XXIV. Hornbills devouring young Paroquets. By Lt.-Col. A. Newnham, I.A. 263

XXV. Jack Snipe in the Cawnpore District. By Capt. W. B. Spalding, R.A. 264

XXVI. Nesting of the Cinereous Vulture (*Vultur monachus*) near Quetta. By Major T. E. Marshall 264

XXVII. Uncommon Birds in Burma. By J. P. Cook 265

XXVIII. Falcon and Gulls. By Lt.-Col. S. E. Prall, I.M.S. 267

XXIX. Nesting of the Osprey or Sea-Hawk. By Lt.-Col. S. E. Prall, I.M.S. 268

XXX. European Great Bustard in Chitral. By N. B. Kinnear 268

XXXI. Woodcock in Kulu. By J. Coldstream, I.C.S. 269

XXXII. Occurrence of Swinhoe's Snipe (*Gallinago megala*) at Myitkyina, Upper Burma. By Capt. F. E. W. Venning 269

XXXIII. Occurrence of the Fantail Snipe (*Gallinago cœlestis*) in Siam. By D. O. Witt, I.F.S., and W. J. F. Williamson .....

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

XXXIV. Snipe Shooting in Upper Burma. By E. N. Bell 271

XXXV. The Occurrence of a "Booby," *Sula cyanops* (?) at Cannanore. By Major H. R. Baker 272

XXXVI. The Occurrence of *Cygnus bewicki* and other Swans in India. By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U. 273

XXXVII. Uncommon Birds in the United Provinces. By Capt. M. A. Girdlestone, 41st Dogras. 274

XXXVIII. Nidification of the Little Grebe or Dabchick (*Podiceps albipennis*). By John Fry..... 275

XXXIX. Recovery of Birds from Injuries. (*With a Text-fig.*) By Lt.-Col. G. H. Evans 276

XL. Habits of the Python (*Python molurus*). By W. Forsyth 277

XLI. Remarks on Two rare Blind Snakes. (*With a Text-fig.*) By Major F. Wall, I.M.S., C.M.Z.S. 278

XLII. On the Occurrence of the Snake *Dipsadomorphus nuchalis* (Beddome) in Berhampur, Orissa. By Major F. Wall, I.M.S., C.M.Z.S.. 279

XLIII. Is *Lycodon gammiei* (Blanford) an aberrant specimen of *Lycodon fasciatus* (Anderson) ? By Major F. Wall, I.M.S., C.M.Z.S. 279

XLIV. Do Snakes swallow stones ? By E. A. D'Abreu, F.Z.S. 281

XLV. Remarks on the Greater and Lesser Black Kraits (*Bungarus niger* and *B. lividus*). By Major F. Wall, I.M.S., C.M.Z.S. 281

XLVI. Large Common and Banded Kraits. By Major O. A. Smith, 27th Punjabis 283

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

XLVII. The Development of Embryo in the Eggs of the Oviparous Viper, *Lachesis monticola*, prior to oviposition. By Major F. Wall, I.M.S., C.M.Z.S. 284

XLVIII. A Sporting Kashmir Fish, the Cheroo, *Schizothorax esocinus*. By F. J. Mitchell 285

XLIX. Note on Distribution of *Lethe kansa* (Moore) and *Dophla patala* (Kollar). By F. Hannyngton 286

L. Appeal for information concerning *Papilio polytes*. By J. C. F. Fryer 287

LI. A Note on *Polyommatus bæticus*. By Capt. F. C. Fraser, I.M.S. 287

LII. Some disputed points in the Anatomy of a common Indian Earthworm. (*With 3 Text-figs.*) By Capt. R. E. Lloyd, I.M.S., and A. Powell 289

LIII. A Natural Bird-lime. By C. Gilbert Rogers. 293

LIV. Natural Selection. By C. E. C. Fischer, I.F.S. 294

LV. Immunity of Animals to Snake-bite. By Capt. A. H. Mosse, I.A. 295

LVI. Natural History Notes from the Red Sea. By F. Hannyngton, I.C.S. 299

PROCEEDINGS 300

No. 2.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON. Part VI. (*With Plates V, VI, and A.*) By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U. 302

SOME NEW INDIAN RODENTS. (*With a Plate and 2 Text-figs.*). By R. C. Wroughton, F.Z.S. 338

THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED. Part VI. (*With Plates. XXVI—XXXII, and Text-figs. 20-23*). By E. Blatter, S.J. 343

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA. Report by R. C. Wroughton, F.Z.S. 392

THE MOTHS OF INDIA. Supplementary Paper to the volumes in "The Fauna of British India." Series IV, Part III. By Sir George F. Hampson, Bart., F.Z.S., F.E.S. 411

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES. Part XVII. (*With Plate XVII.*) By Major F. Wall, I.M.S., C.M.Z.S. 447

A MONOGRAPH OF THE WASPS OF THE GENUS *Cerceris* INHABITING BRITISH INDIA. With Notes on other Asiatic Species. (*With Plates A. and B.*) By Rowland E. Turner, F.Z.S., F.E.S. 476

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA (Including those met with in the Hill Stations of the Bombay Presidency). Part X. (*With Plates D2, D3, D4.*) By T. R. Bell, I.F.S. 517

BIRD NOTES BY THE WAY IN KASHMIR. (*With 2 Text-figs.*) By Major H. A. F. Magrath 545

A LIST OF INDIAN BUTTERFLIES. By Capt. W. H. Evans, R.E. 553

SOME MAYMYO BIRDS. Part II. By Major H. H. Harington 585

NOTES ON BUTTERFLIES FROM THE NAGA HILLS. Part II. (*With Plate B.*) By Major H. C. Tytler, 17th Infantry 588

NOTES ON FLATA. (*With Plates A. & B.*) By J. C. Kershaw, F.Z.S., F.E.S. 607

THE OOTHECA OF AN ASILID. (*With Plates A. & B.*) By J. Kershaw, F.Z.S., F.E.S. 610

RAMBLING NOTES ON NATURAL HISTORY IN CHITRAL. (*With 2 Text-figs.*) By Major F. Wall, I.M.S., C.M.Z.S. 614

SOME BIRDS AND BIRDS' NESTS FROM HAKA, CHIN HILLS. By Capt. F. E. W. Venning 621

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

A NEW SNAKE, *Psammophis triticeus*, FROM BALUCHISTAN. (*With 2 Text-figs.*) By Major F. Wall, I.M.S., C.M.Z.S.. 634

DESCRIPTION OF A NEW SPECIES OF *Acmaea* FROM BOMBAY, AND NOTES ON OTHER FORMS FROM THAT LOCALITY. (*With a Text-fig.*) By Edgar A. Smith, I.S.O. 637

PROGRESS OF THE MAMMAL SURVEY. (*With a Plate and a Map*) 640

REVIEWS. "Forty years among the Wild Animals of India." By F. C. Hicks, and "Medical Entomology." By A. Alcock 645

OBITUARY NOTICE. E. W. Oates 651

MISCELLANEOUS NOTES :—

I. The number of Cubs in a Tiger's litter. By Lt. C. R. S. Pitman, 27th Punjabis 653

II. The Stoat in Kashmir. By Major H. A. F. Magrath 653

III. A Deformed Thamin Stag (*Cervus eldii*). (*With a Text-fig.*) By A. H. D. Barron, 17th Infantry 654

IV. Do Chinkara (*Gazella bennetti*) drink water? By Lt. C. R. S. Pitman, 27th Punjabis ... 655

V. Indian Breeds of Sheep. By H. J. Elwes. 655

VI. The Banting or Tsaing (*Bos sondaicus*). (*With a Text-fig.*) By A. Rodgers 656

VII. The Colouration of Tigers. By Lt. C. R. S. Pitman, 27th Punjabis 657

VIII. A Deformed Head of the Four-horned Antelope. By C. R. S. Pitman, 27th Punjabis..... 658

IX. The Pintail Duck (*Dafila acuta*) shot in September. By Major H. A. F. Magrath. 658

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

X. Occurrence of European Striated Swallow (*Hirundo rufula*) in Kangra. By H. Whistler, Indian Police 659

XI. Nidification of the Tweeddale Scimitar Babbler (*Pomatorhinus nuchalis*). By J. P. Cook..... 659

XII. The Paradise Flycatcher (*Terpsiphone paradisi*). By Major H. A. F. Magrath 660

XIII. The Crag Martin (*Ptyonoprogne rupestris*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. ... 660

XIV. Extension of the Habitat of the Common Kingfisher (*Alcedo ispida*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 661

XV. Note on the Common Kingfisher (*Alcedo ispida*). By Major H. A. F. Magrath ... 661

XVI. The Notes of Pallas's Fishing-Eagle (*Haliaëtus leucoryphus*) and some water birds. By Major H. A. F. Magrath 662

XVII. Immature Plumage of Lammergayer (*Gypaëtus barbatus*). By H. Whistler, I.P. 663

XVIII. Occurrence of the Goshawk (*Astur palumbarius*) in Sind. By Raymond W. Cooper 665

XIX. Extension of the Habitat of the Brahminy Kite (*Haliastur indus*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 665

XX. The Painted Snipe (*Rostratula capensis*). By Lt. C. R. S. Pitman, 27th Punjabis... 666

XXI. Painted Snipe (*Rostratula capensis*) in large numbers. By A. H. Kingston 667

XXII. Record of Snipe Shot at Hminelongyee, in the Chiengmai District of Siam, 18·15 North Lat., 98° East Long., from 1905 to 1910. By D. L. Keddie..... 667

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

XXIII. Notes on some of the Bird Life at Thandoung. By J. P. Cook 668

XXIV. Migration of Baya (*Ploceus baya*). By A. B. Punde, D.F.O. 675

XXV. The Maroon Oriole (*Oriolus traillii*). By Alex. M. Primrose 676

XXVI. Wood Snipe (*Gallinago nemoricola*) occurring near Bangalore. By Lieut.-Col. R. M. Betham, 10th Grenadiers..... 677

XXVII. Goose-shooting in Cutch. By Maharaj Kumar Shri Vijayarajji..... 678

XXVIII. Falcons and their prey. By Lt.-Col. S. E. Prall, I.M.S. 680

XXIX. On the Occurrence of the Common Wood Shrike (*Tephrodornis pondicerianus*) and the Central Asian Black-bird (*Merula maxima*) near Peshawar. By H. A. F. Magrath, 51st Sikhs, F. F. 680

XXX. Habits, Food and Nesting of the Great Himalayan Barbet (*Megalæma marshallorum*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. ... 681

XXXI. Marbled Duck at Baroda. By Lt.-Col. R. G. Burton, 94th Russell's Infantry 684

XXXII. The Sooty Tern (*Sterna fuliginosa*) in Cachar. By E. C. Stuart Baker, F.Z.S., F.L.S. 684

XXXIII. Notes on the Southern Migration of Snipe near Calcutta, 1911. By C. R. S. Pitman, 27th Punjabis 684

XXXIV. Occurrence of the Nukhta or Comb-duck (*Sarcidiornis melanonota*) in Sind. By M. Webb, I.C.S. 685

XXXV. The Breeding of the False Himalayan Viper (*Psammodynastes pulverulentus*). By Major F. Wall, I.M.S., C.M.Z.S..... 686

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

XXXVI. Food of the snake *Rhabdops bicolor*. By Major F. Wall, I.M.S., C.M.Z.S. 686

XXXVII. The Diet of the Bull-Frog (*Rana tigrina*). By S. P. Agharkar 687

XXXVIII. Notes on the Indian Chamæleon (*Chamæleon calcaratus*). By C. Chenevix Trench, I.C.S. 687

XXXIX. Snake eating a Snipe. By Capt. F. E. W. Venning 689

XL. Some Notes on the Hatching of the Agamoid Lizard (*Calotes jerdoni*). (*With a Text-fig.*) By Capt. F. E. W. Venning 690

XLI. Breeding of Macclelland's Coral Snake (*Callophis macclellandi*). By Major F. Wall, I.M.S., C.M.Z.S..... 693

XLII. The Madras Aquarium. By N. Annandale. 693

XLIII. The Life of a Dog Tick. By Capt. W. J. Massy, 12th Pioneers 694

XLIV. Asilid Oviposition. (*With a Text-fig.*). By S. K. Sen, Asst. to 2nd Imp. Ent. 695

XLV. Caterpillar Pest on Cotton in Khandesh. By R. S. Kasargode, Lecturer on Entomology, Poona Agricultural College 698

XLVI. Note on the Butterflies *Lethe kansa* and *Dophla patala*. By G. W. V. DeRhè-Philipe, F.E.S. 698

XLVII. *Papilio polytes* in Bangalore. By K. Kunhi Kannan, Asst. to State Mycologist and Entomologist 699

XLVIII. A Note on *Trichosanthes dioica*, Roxb. By Lt.-Col. K. R. Kirtikar, I.M.S. (Ret.) 700

XLIX. Notes on the Flora of the Vale of Kashmir. By J. H. A. Ivens 701

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

L. Second Year's growth of a Plantain Inflorescence. (*With a Text-fig.*). By W. Burns, Economic Botanist, Poona. 706

LI. A Fly Trap (*Boucerosia crenulata*, Wight and Arn.). By Capt. F. E. W. Venning 707

LII. Note on *Macrochlamys* (*Eurychlamys*) *platychlamys* (Blanford), etc. By A. J. Peile. 707

LIII. Conchological Notes from Bombay. By Lionel E. Adams, B.A. 708

LIV. Notes on the Cutch Ammonites. (*With a Map and 2 Diagrams*). By J. H. Smith.. 709

PROCEEDINGS..... 716

No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON. Part VII. (*With Plates VII and A. & B.*). By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U. 721

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA. (Including those met with in the Hill Stations of the Bombay Presidency). Part XI. (*With 2 Text-figs.*). By T. R. Bell, I.F.S. 740

SOME NEW INDIAN MAMMALS. (*With a Text-fig.*). By R. C. Wroughton 767

TERMITES FROM BRITISH INDIA (Bombay) COLLECTED BY DR. J. ASSMUTH, S.J. (*With Plates A-D*). By Nils Holmgren (Stockholm) 774

A MONOGRAPH OF THE WASPS OF THE GENUS *Cerceris* INHABITING BRITISH INDIA. With Notes on other Asiatic Species. Part II. (*With Plates C. & D.*). By Rowland E. Turner, F.Z.S., F.E.S. 794

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA. Report by R. C. Wroughton, F.Z.S. (*With 3 Text-figs.*) 820

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE.

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA. Part XV. By E. Meyrick, B.A., F.R.S., F.Z.S. 852

THE MOTHS OF INDIA. Supplementary Paper to the volumes in "The Fauna of British India." Series IV, Part IV. By Sir George F. Hampson, Bart., F.Z.S., F.E.S. 878

THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED. Part VII. (*With Plates XXXIII—XXXIX, and Text-figs. 24—27*). By E. Blatter, S.J.... 912

A LIST OF INDIAN BUTTERFLIES. Part II. By Capt. W. H. Evans, R.E. 969

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES. Part XVIII. (*With Plate XVIII, Diagram and Map*). By Major F. Wall, I.M.S., C.M.Z.S. 1009

PLANTS OF THE PUNJAB. A Brief Descriptive Key to the Flora of the Punjab, North-West Frontier Province and Kashmir. Part X. By Colonel C. J. Bamber, F.L.S., Indian Medical Service 1022

PROGRESS OF THE MAMMAL SURVEY..... 1060

MISCELLANEOUS NOTES :—

I. Notes on Tigers. By C. E. C. Fischer, I.F.S., F. Dewar, I.C.S., Lieut.-Colonel R. G. Burton, 94th Russell's Infantry, and Capt. V. A. S. Keighley, Viceroy's Bodyguard.. 1062

II. Notes on Panthers. By Lieut.-Colonel R. G. Burton, 94th Russell's Infantry 1063

III. A large Oorial head. (*With a Text-fig.*) By Colonel H. V. Biggs 1065

IV. The so-called One-horned Sheep of Nepal and other breeds. (*With a Plate and a Text-fig.*) By Lieut.-Colonel J. Manners-Smith. 1066

V. Some Notes from the Abor Expedition. (*With a Text-fig.*) By Major Alban Wilson, 8th Gurkhas..... 1068

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

VI. Do Chinkara (*Gazella bennetti*) drink water? By Lt.-Col. R. G. Burton, 94th Russell's Infantry, and F. Dewar, I.C.S. 1068

VII. Recovery of Animals from Injuries. By W. J. H. Ballantine, Assistant Political Officer, Sadiya 1069

VIII. Note on Takin (*Budorcas taxicolor*). (*With 2 Plates*). By Capt. F. M. Bailey 1069

IX. Gayal or Mithan (*Bibos frontalis*). (*With a Text-fig.*) By Capt. F. M. Bailey 1071

X. Tsine (*Bibos sondaicus*) found with village cattle. By T. A. Hauxwell, Conservator of Forests, Burma 1072

XI. Notes on Birds from Lahore. By A. E. Jones 1073

XII. Nestling Plumage of the Great Stone Plover (*Esacus recurvirostris*). By H. Whistler, Indian Police 1074

XIII. The Himalayan Greenfinch (*Hypacanthis spinoidis*, Vigors). By H. Whistler, Indian Police 1074

XIV. Distribution, Habits, and Nesting of the Himalayan Greenfinch (*Hypacanthis spinoides*, Vigors). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1075

XV. The Long-tailed Grass Warbler (*Laticilla burnesi*, Blyth). By H. Whistler, Indian Police 1080

XVI. Nidification of Burmese Great Black Woodpecker (*Thriponax feddeni*). By J. P. Cook 1081

XVII. A Kite's Larder. By G. L. Remington. ... 1082

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

XVIII. Occurrence of the Common Peafowl (*Pavo cristatus*, Linn.) in the neighbourhood of Simla, N.-W. Himalayas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1082

XIX. Swinhoe's Snipe (*Gallinago megala*) near Madras. By R. F. Stoney, and I. S. Fraser 1083

XX. Cruelty to Wild Fowl, &c., in Sind. By Capt. C. H. Elliot, 58th Rifles, F.F. 1083

XXI. The Himalayan Snow Cock (*Tetrogallus himalayensis*). (*With a Text-fig.*) By W. G. Appleford 1084

XXII. Woodcock (*Scolopax rusticula*) in South Andamans. By Major J. H. Whitehead, 93rd Burma Infantry 1085

XXIII. Note on the Habits of Swinhoe's Reed-Warbler (*Urosphena squamiceps*) and on the Nesting of the Burmese Great Wood-pecker (*Triponax feddeni*). By J. P. Cook 1085

XXIV. Chinese Grey Duck in Burma. By Major H. H. Harington..... 1086

XXV. Nidification of Davison's Babbler (*Turdinulus exsul*). By S. M. Robinson. 1088

XXVI. The Sheldrake (*Tadorna cornuta*) in the United Provinces. By F. B. Scott 1089

XXVII. Notes on some Birds from the Chindwin Valley. By Cyril Hopwood, D. C. Forests 1089

XXVIII. Baikal or Clucking Teal (*Nettium formosum*) shot in Assam. By Francis W. Gore, and Evan A. Evans..... 1090

XXIX. Insects in the Nest of the Common Swift (*Cypselus affinis*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1091

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

XXX. Distribution of the Cricket *Schizodactylus monstruosus*. By Lieut. W. P. C. Tenison, R.F.A. 1091

XXXI. Intelligence of Ants. By F. B. Scott. 1092

XXXII. The Castor Rust (? *Melampsorella ricini*, De Tomi). (*With Plates A. & B.*). By S. L. Ajrekar, B.A., Assistant Professor of Mycology, Poona..... 1092

XXXIII. Notes on Cacti in North-West India. By R. N. Parker, D. C. Forests..... 1095

XXXIV. A branching Palmyra Palm (*Borassus flabellifer*. (*With a Text-fig.*). By R. F. Stoney.. 1098

XXXV. Rate of growth of a Dhaman (*Zamenis mucosus*) hatchling. By E. A. D'Abreu, F.Z.S. 1099

XXXVI. The rupture of the Egg-shell in the Genus *Calotes*. By N. Annandale..... 1099

XXXVII. Chinese Gold Fish (*Carassius auratus*). By F. H. S. Stone..... 1100

XXXVIII. Horse-Mackerel attacking Jelly Fish. By F. H. S. Stone 1101

PROCEEDINGS..... 1102

No. 4.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON. Part VIII. (*With Plate VIII*). By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U..... 1109

ORCHIDS OF THE BOMBAY PRESIDENCY. Part XIII. By G. A. Gammie, F.L.S. 1129

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY). Part XII. (*With Plates I & J., and Text-figs. 15-22*). By T. R. Bell, I.F.S. ... 1131

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

NOTES ON A BIRD COLLECTING TRIP IN THE BALAGHAT DISTRICT OF THE CENTRAL PROVINCES. By E. A. D'Abreu, F.Z.S. 1158

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA. Report by R. C. Wroughton, F.Z.S. (*With a Plate and 2 Text-figs.*) 1170

A LIST OF BIRDS FROM ARAKAN. By Cyril Hopwood, I.F.S. 1196

THE MOTHS OF INDIA. Supplementary Paper to the volumes in "The Fauna of British India." Series IV, Part V. (*With Plate G.*). By Sir George F. Hampson, Bart., F.Z.S., F.E.S. 1222

THE FUNGI OF INDIA. Part I. (*With Plates I—IV., and Text-figs. 1-10*). By F. Theissen, S.J. 1273

MORE BIRD NOTES BY THE WAY IN KASHMIR. (*With 2 Text-figs.*). By Lt.-Col. H. A. F. Magrath 1304

PROGRESS OF THE MAMMAL SURVEY 1315

MISCELLANEOUS NOTES :—

I. Tiger (*Felis tigris*) killing and eating its young. By James W. Best, I.F.S. 1318

II. Cannibalism among Panthers (*Felis pardus*). By Major J. R. Carter, Bombay Political Department 1319

III. Number of a Panther's (*Felis pardus*) caudal vertebræ. By Captain A. H. Mosse, I.A 1319

IV. Notes on Martens in Kashmir. By Lt.-Col. H. A. F. Magrath 1320

V. Notes on the Time of Appearance and Flight of Eastern Bats. By G. C. Shortridge ... 1321

VI. The Habits of Voles. (*With a Diagram*). By Lt.-Col. H. A. F. Magrath 1322

VII. The Indian Buffalo (*Bubalus bubalis*). By G. C. Shortridge 1323

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

VIII. Tsine (*Bibos sondaicus*) consorting with tame cattle. By Major G. P. Evans, XIX Punjabis 1323

IX. Habits of the Kashmir Stag (*Cervus kashmiriensis*) in summer. By Lt.-Col. H. A. F. Magrath 1325

X. Abnormal type (?) of Eggs of the Little Forktail (*Microcichla scouleri*, Vigors). By P. T. L. Dodsworth, F.Z.S., M.B.O.U..... 1327

XI. Nesting of the Western Blue Rock Thrush (*Petrophila cyanus*, Linn.) in the neighbourhood of Simla, N.-W. Himalayas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1328

XII. The Himalayan Greenfinch (*Hypacanthis spinoides*). By Lt.-Col. H. A. F. Magrath 1329

XIII. Early arrival of Grey Wagtail. By J. Donald, I.F.S. 1329

XIV. Eggs of the Large Hawk-Cuckoo (*Hierococcyx sparverioides*). By A. E. Osmaston 1330

XV. Question whether *Gyps fulvus*, Gmelin, the Griffon, occurs in the Himalayan districts of the Punjab. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1331

XVI. A Kite's larder. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1332

XVII. Tameness of Great Indian Bustard (*Eupodotis edwardsi*). By R. Teague Jones, Indian Police 1333

XVIII. Bustard in Kathiawar. By Major J. R. Carter, Bombay Political Department..... 1333

XIX. The Great Indian Bustard (*Eupodotis edwardsi*). By A. B. Aitken 1334

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

XX. The Masked Booby (*Sula cyanops*) in Bombay Harbour. By N. B. Kinnear 1334

XXI. Baikal or Clucking Teal (*Nettium formosum*). By A. B. Aitken 1335

XXII. Is *Lycodon gammiei* (Blanford) an aberrant specimen of *Lycodon fasciatus* (Anderson)? (*With a Text-fig.*). By E. A. D'Abreu, F.Z.S. 1335

XXIII. Notes on the size and breeding of the common Green Whip-snake (*Dryophis mycterizans*). By N. B. Kinnear 1336

XXIV. Cobra breeding at Parel. By Surgeon-General W. B. Bannerman, I.M.S., and Senior Assistant Surgeon J. P. Pocha, L.M. & S. 1337

XXV. Breeding of the Common Green Viper (*Lachesis gramineus*). By N. B. Kinnear. 1339

XXVI. Saw-Scaled Viper (*Echis carinata*) as a tree snake. By Capt. A. H. E. Mosse, I.A. ... 1339

XXVII. Habitat of *Echis carinata*. By Capt. G. G. Jolly, I.M.S. 1340

XXVIII. "Poisonous" Lizards in India. By H. F. Saunders 1341

XXIX. The Food of a Bull-frog (*Rana tigrina*). By J. P. Mullan, M.A. 1341

XXX. Vitality of a Butterfly. By Capt. G. A. Hassels-Yates, R.G.A. 1342

XXXI. The Bed Bug (*Cimex rotandatus*) on the Common Yellow Bat (*Scotophilus kuhli*). By K. Kunhikannan, M.A., F.E.S., Assistant Entomologist, Bangalore 1342

XXXII. Flies on Snow. By Lt.-Col. H. A. F. Magrath 1342

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

XXXIII. Preservation of Game. (*With a Text-fig.*). By St. G. de Carteret 1343

XXXIV. Notes on Cutch Ammonites. II. (*With 2 Diagrams*). By J. H. Smith 1347

XXXV. Ammonites from Cutch. By H. J. Davies, F.G.S. 1352

XXXVI. The Trinomial System of Nomenclature. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1354

XXXVII. Letter from Mr. A. D. Younghusband, C.S.I., I.C.S., Commissioner in Sind, on Cruelty to Wild Fowl in Sind 1356

PROCEEDINGS 1358

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ALPHABETICAL LIST OF CONTRIBUTORS.

VOLUME XXI.

PAGE

ADAMS, LIONEL E., B.A.; Conchological Notes from Bombay 708

AGHARKAR, S. P.; The Diet of the Bull-Frog (*Rana tigrina*). 687

AITKEN, A. B.; The Great Indian Bustard (*Eupodotis edwardsi*) 1334

————; Baikal or Clucking Teal (*Nettium formosum*) 1335

AJREKAR, S. L., B.A., Assistant Professor of Mycology, Poona; The Castor Rust (*Melampsorella ricini*, De Tomi). (*With Pls. A. & B.*) 1092

ALLEN, C. W., D. F. O.; The Birth of a Wild Elephant Calf 239

ALLEN, P. ROSCOE; Mungooses in the Eastern Ghats .. 237

ANNANDALE, N.; The Madras Aquarium 693

————; The rupture of the Egg-shell in the Genus *Calotes* 1099

APPLEFORD, W. G.; The Himalayan Snow Cock (*Tetrogallus himalayensis*). (*With a Text-fig.*) 1084

BAILEY, Captain F. M.; Some Notes on Birds from Gyantse and Chumbi in Tibet, with a List of the Game Birds killed during the four years, 1906-1909 178

PAGE

BAILEY, Captain F. M.; Notes on Takin (*Budorcas taxicolor*). (*With 2 Plates.*) 1069

————; Gayal or Mithan (*Bibos frontalis*). (*With a Text-fig.*) 1071

BAKER, E. C. STUART, F.L.S., F.Z.S., M.B.O.U.; The Game Birds of India, Burma and Ceylon. Part V .. 20

————; The Occurrence of *Cygnus bewicki* and other Swans in India.. 273

————; The Game Birds of India, Burma and Ceylon. Part VI. (*With Pls. V, VI, and A.*) 302

————; The Sooty Tern (*Sterna fuliginosa*) in Cachar .. 684

————; The Game Birds of India, Burma and Ceylon. Part VII. (*With Pls. VII., and A., and B.*) 721

————; The Game Birds of India, Burma and Ceylon. Part VIII. (*With Pl. VIII.*) .. 1109

BAKER, Major H. R.; The Occurrence of the "Booby," *Sula cyanops* (?) at Cannanore 272

BALLANTINE, W. J. H., Assistant Political Officer, Sadiya; Recovery of Animals from Injuries 1069

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

BAMBER, Colonel C. J., F.L.S., Indian Medical Service; Plants of the Punjab. A Brief Descriptive Key to the Flora of the Punjab, North-West Frontier Province and Kashmir. Part IX .. 203

——————————; Plants of the Punjab. A Brief Descriptive Key to the Flora of the Punjab, North-West Fontier Province and Kashmir. Part X 1022

BANNERMAN, Surgeon-General W. B., and POCHA, Senior Assistant Surgeon, J.P., L.M. & S.; Cobra breeding in Parel 1337

BARRON, A. H. D., 17th Infantry; A Deformed Thamin Stag (*Cervus eldii*). (*With a Text-fig.*) 854

BELL, E. N.; Snipe Shooting in Upper Burma 271

BELL, T. R., I. F. S.; The Common Butterflies of the Plains of India (Including those met with in the Hill Stations of the Bombay Presidency). Part X. (*With Pls. D 2, D 3 and D 4*) .. 517

——————————; The Common Butterflies of the Plains of India (including those met with in the Hill Stations of the Bombay Presidency). Part XI. (*With 2 Text-figs.*) 749

——————————; The Common Butterflies of the Plains of India (including those met with in the Hill Stations of the Bombay Presidency). Part XII. (*With Pls. I. and J. and Text-figs.* 15-22) 1131

PAGE

BEST, JAMES W., I. F.S.; Tiger calling like a Sambur .. 235

——————————; Tiger (*Felis tigris*) killing and eating its young 1318

BETHAM, Lieut.-Col. R. M., 10th Grenadiers; Wood Snipe (*Gallinago nemoricola*) occurring at Bangalore .. 677

BIGGS, Colonel H. V.; A Large Oorial head. (*With a Text-fig*) 1065

BLATTER, E., S. J.; The Palms of British India and Ceylon, Indigenous and Introduced Part V. (*With Pls. XVIII-XXV and Text-figs.* 13-19).. 66

——————————; A List of Indian Fungi, chiefly of the Bombay Presidency, with the Description of Two New Species. (*With a Plate*). 146

——————————; The Palms of British India and Ceylon, Indigenous and Introduced. Part VI. (*With Pls. XXVI-XXXII and Text-figs.* 20-23.) 343

——————————; The Palms of British India and Ceylon, Indigenous and Introduced. Part VII. (*With Pls. XXXIII-XXXIX and Text-figs.* 24-27.) 912

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA; Progress of— .. 229

——————————; Report by R. C. Wroughton, F.Z.S. 392

——————————; Progress of—(*With a Plate and a Map*) 640

——————————; Report by R. C. Wroughton, F.Z.S. (*With 3 Text-figs.*) 820

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA; Progress of— .. 1060

——————————; Report by R. C. Wroughton, F.Z.S. (*With a Plate and 2 Text-figs.*) 1170

——————————; Progress of— 1315

BURNS, W., Economic Botanist, Poona; Second year's growth of a Plantain Inflorescence. (*With a Text-fig.*). 706

BURTON, Lt.-Col. R. G., 94th Russell's Infantry; Marbled Duck at Baroda 684

——————————; Notes on Tigers 1062

——————————; Notes on Panthers.. 1063

——————————; Do Chinkara (*Gazella bennetti*) drink water? 1068

CARTER, Major J. R., Bombay Political Department; Cannibalism among Panthers (*Felis pardus*) 1319

——————————; Bustard in Kathiawar 1333

COLDSTREAM, J., I.C.S.; Woodcock in Kulu 269

COOK, J. P.; Uncommon Birds in Burma 265

——————; Nidification of the Tweeddale Scimitar Babbler (*Pomatorhinus nuchalis*). 659

——————; Notes on some of the Bird Life at Thandoung. 668

——————; Nidification of Burmese Great Black Woodpecker (*Thriponax feddeni*).. 1081

——————; Notes on the Habits of Swinhoe's Red-Warbler (*Urosphenax squamiceps*) and on the nesting of the Burmese Great Woodpecker (*Thriponax feddeni*).. 1085

COOPER, RAYMOND W.; Occurrence of the Goshawk (*Astur palumbarius*) in Sind .. 665

CROSS, H. E.; Young Tiger attacking human beings .. 236

D'ABREU, E. A., F.Z.S.; Do snakes swallow stones? .. 281

——————————; Rate of growth of a Dhaman (*Zamenis mucosus*) hatchling .. 1099

——————————; Notes on a Bird collecting trip in the Balaghat District of the Central Provinces 1158

——————————; Is *Lycodon gammiei* (Blanford), an aberrant specimen of *Lycodon fasciatus* (Anderson) (*With a Text-fig.*) 1335

DAVIS, H. J., F.G.S.; Large heads of Malay Sambar and Brow Antlered Deer .. 248

——————————; Ammonites from Cutch 1352

DE CARTERET, ST. G.: Preservation of Game. (*With a Text-fig.*) 1343

DE RHE-PHILIPE, G. W. V., F.E.S.; Note on the Butterflies *Lethe kansa* and *Dophla patala* 698

DEWAR, F., I.C.S.; Notes on Tigers 1062

——————————; Do Chinkara (*Gazella bennetti*) drink water? 1069

DODSWORTH, P. T. L., F.Z.S., M.B.O.U.; Crow and its food 248

——————————; Notes relating to the Habits

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

and Nidification of the Black-headed Sibia, *Lioptila capistrata* (Vigors). (*With 2 Text-figs.*) 249

Dodsworth, P. T. L., F. Z. S., M. B. O. U. Notes on the Nidification of *Microcichla scouleri* (Vigors), The Little Forktail 257

———————; Occurrence of *Hemilophus pulverulentus*: (Temm.) The Great Slaty Woodpecker in the neighbourhood of Simla, N.-W. Himalayas 263

———————; The Crag Martin (*Ptyonoprogne rupestris*) 660

———————; Extension of the Habitat of the Common Kingfisher (*Alcedo ispida*) 661

———————; Extension of the Habitat of the Brahminy Kite (*Haliastur indus*) 665

———————; Habits, Food and Nesting of the Great Himalayan Barbet (*Megalæma marshallorum*) .. 681

———————; Distribution, Habits, and Nesting of the Himalayan Greenfinch (*Hypacanthis spinoides*, Vigors) 1075

———————; Occurrence of the Common Peafowl (*Pavo cristatus*, Linn.) in the neighbourhood of Simla, N.-W. Himalayas . 1082

———————; Insects in the nest of the Common Swift (*Cypselus affinis* 1091

PAGE

Dodsworth, P. T. L., F.Z.S., M.B.O.U.; Abnormal type(?) of Eggs of the Little Forktail (*Microcichla scouleri*, Vigors) 1327

———————; Nesting of the Western Blue Rock Thrush (*Petropila cyanus*, Linn.) in the neighbourhood of Simla, N.-W. Himalayas 1328

———————; Question whether *Gyps fulvus*, Gmelin, the Griffon, occurs in the Himalayan districts of the Punjab .. 1331

———————; A Kite's larder 1332

———————; The Trinomial System of nomenclature 1354

Donald, J., I. F. S.; Early arrival of Grey Wagtail .. 1329

Elliot, Capt. C. H., 58th Rifles, F. F.; Cruelty to Wild Fowl, &c., in Sind 1083

Elwes, H. J.; The Domestic Breeds of Indian Sheep .. 245

———————; Indian Breeds of Sheep 655

Evans, Evan A.; Baikal or Clucking Teal (*Nettium formosum*) shot in Assam .. 1091

Evans, Lieut.-Colonel G. H.; Strange mortality amongst Black Buck (*Antelope cervicapra*) 247

———————; Recovery of Birds from Injuries. (*With a Text-fig.*).. 276

Evans, Major G. P., XIX Punjabis; Tsine (*Bibos sondaicus*) consorting with tame cattle.. 1323

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

EVANS, Capt. W. H., R. E.; A List of Indian Butterflies. 553

——————————; A List of Indian Butterflies Part II 969

FAWCETT, Col. J. M.; Mimicry in Silk-Worm Moths ... lxxxix

FISCHER, C. E. C., I. F. S.; Notes on Tigers 1062

——————————; Natural Selection 294

FITZ-GIBBON, Lieut. F.; Panther and Wild Boar .. 237

FORSYTH, W.; Habits of the Python (*Python molurus*) .. 277

FRASER, Capt. F. C., I. M. S.; A note on *Polyommatus bœticus* 287

FRASER, I. S.; Swinhoe's Snipe (*Gallinago megala*) near Madras 1083

FRY, JOHN; Nidification of the Little Grebe or Dabchick (*Podiceps albipennis*) 275

FRYER, J. C. F.; Appeal for information concerning *Papilio polytes* 287

GAMMIE, G. A., F. L. S.; Orchids of the Bombay Presidency. Part XII. (*With Pl. XI*) 171

——————————; Orchids of the Bombay Presidency. Part XIII .. 1129

GIRDLESTONE, Capt. M. A., 41st Dogras; Uncommon Birds in the United Provinces .. 274

GORE, FRANCIS W.; Baikal or Clucking Teal (*Nettium formosum*) shot in Assam .. 1090

HAMPSON, Sir GEORGE F., Bart., F.Z.S., F.E.S.; The Moths of India. Supplementary Paper to the volumes in "The Fauna of British India," Series IV, Part III. 411

——————————; The Moths of India. Supplementary Paper to the volumes in "The Fauna of British India," Series IV, Part IV 878

——————————; The Moths of India. Supplementary Paper to the volumes in "The Fauna of British India", Series IV, Part V. (*With Pl. G*) .. 1222

HANNYNGTON, F., I.C.S.; Note on Distribution of *Lethe kansa* (Moore) and *Dophla patala*, Kollar 286

——————————; Natural History notes from the Red Sea 299

HARINGTON, Major H. H.; Tiger calling like a Sambur. 235

——————————; A new Bar-wing from Burma 256

——————————; Some Maymyo Birds. Part II 585

——————————; Chinese Grey Duck in Burma 1086

HASSELS-YATES, Capt. G. A., R. G. A.; Vitality of a Butterfly 1342

HAUXWELL, T. A., Conservator of Forests, Burma. Tsine (*Bibos sondaicus*) found with village cattle 1072

HOLMGREN, NILS (Stockholm); Termites from British India (Bombay) collected by Dr. J. Assmuth, S.J. (*With Pls. A-D.*). 774

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

HOPWOOD, CYRIL. D. C. Forests; Notes on some Birds from the Chindwin Valley 1089

———————————; A List of Birds from Arakan.. 1196

HOWARD, ALBERT, M.A., A.R.C.S., F.L.S., Imperial Economic Botanist, and HOWARD, GABRIELLE, L.C., M.A., Associate and some time Fellow of Newnham College, Personal Assistant to the Imperial Economic Botanist; The Improvement in the yield and quality of Indian Wheat .. 187

IVENS, J. H. A.; Notes on the Flora of the Vale of Kashmir 701

JOLLY, Capt. G.G., I.M.S.; Habitat of *Echis carinata* .. 1340

JONES, A. E.; Notes on Birds from Lahore 1073

JONES, R. TEAGUE, Indian Police; Tameness of Great Indian Bustard (*Eupodotis edwardsi*) 1333

KANNAN, K. KUNHI, Asst. to State Mycologist and Entomologist; *Papilio polytes* in Bangalore 699

KASARGODE, R. S., Lecturer on Entomology, Poona Agricultural College; Caterpillar Pest on Cotton in Khandesh 698

KEDDIE, D. L.; Record of Snipe Shot at Hminelongyee, in the Chiengmai District of Siam, 18·15 North Lat., 98° East Long., from 1905 to 1910 667

KEIGHLEY, Capt. V. A. S., Viceroy's Bodyguard; Notes on Tigers 1063

KERSHAW, J.C., F.Z.S., F.E.S.; Notes on Flata. (*With Pls. A. & B.*) 607

———————————; The Ootheca of an Asilid. (*With Pls. A. & B.*).. .. 610

KHENGARJI, R.; Distribution of the Sloth-Bear (*Melursus ursinus*), and the Indian Lion (*Felis leo*) 238

KING, R. C. H. Moss, I.C.S.; The Resident Birds of the Saugor and Damoh Districts, Central Provinces .. 87

KINGSTON, A. H.; Painted Snipe (*Rostratula capensis*) in large numbers 667

KINNEAR, N. B.; Golden Cat, *Felis temmincki*, killing Buffalo Calf. 237

———————————; Notes on Birds round Rawal Pindi.. 256

———————————; European Great Bustard in Chitral 268

———————————; The Masked Booby (*Sula cyanops*) in Bombay Harbour 1334

———————————; Notes on the size and breeding of the common Green Whip-snake (*Dryophis mycterizans*) 1336

———————————; Breeding of the Common Green Viper (*Lachesis gramineus*) 1339

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

KIRTIKAR, Lt.-Col. K. R., I.M.S. (Ret.); A note on *Trichosanthes dioica* 700

KUNHIKANNAN, K., M.A., F.E.S., Assistant Entomologist, Bangalore; The Bed Bug (*Cimex rotandatus*) on the Common Yellow Bat (*Scotophilus kuhli*) 1342

LLOYD, Capt. R.E., I.M.S.; Some disputed points in the Anatomy of a common Indian Earthworm (*With 3 Text-figs.*) 289

MAGRATH, Lt.-Col. H. A. F.; Bird Notes by the way in Kashmir (*With 2 Text-figs.*)... 545

———————————; The Stoat in Kashmir .. 653

———————————; The Pintail Duck (*Dafila acuta*) shot in September .. 658

———————————; The Paradise Flycatcher (*Terpsiphone paradisi*) .. 660

———————————; Note on the Common Kingfisher (*Alcedo ispida*) .. 661

———————————; The notes of Pallas's Fishing Eagle (*Haliaëtus leucoryphus*) and some water birds. 662

———————————; On the Occurrence of the Common Wood Shrike (*Tephrodornis pondicerianus*) and the Central Asian Blackbird (*Merula maxima*) near Peshawar 680

———————————; More Bird Notes by the way in Kashmir (*With 2 Text-figs.*) 1304

PAGE

MAGRATH, Lt.-Col. H. A. F.; Notes on Martens in Kashmir 1320

———————————; The Habits of Voles (*With a diagram*) 1322

———————————; Habits of the Kashmir Stag (*Cervus kashmiriensis*) in summer 1325

———————————; The Himalayan Greenfinch (*Hypacanthis spinoides*) .. 1329

———————————; Flies on Snow 1342

MANNERS-SMITH, Lt.-Col. J.; The so-called One-horned Sheep of Nepal and other Breeds (*With a Plate and a Text-fig.*) 1066

MARSHALL, Major T. E.; Nesting of the Cinereous Vulture (*Vultur monachus*) 264

MARTIN, AYLMER F.; Notes on the Gaur (*Bos gaurus*) .. 241

MASSY, Capt. W. J., 12th Pioneers; The Life of a Dog Tick 694

MEYRICK, E. B. A., F.R.S., F.Z.S.; Descriptions of Indian Micro-Lepidoptera, Part XIV 104

———————————; Description of Indian Micro-Lepidoptera, Part XV .. 852

MITCHELL, F. J.; A Sporting Kashmir Fish, the Cheroo (*Schizothorax esocinus*) .. 285

MOSSE, Capt. A. H., E.I.A.; Immunity of Animals to Snake-bite 295

———————————; Number of a Panther's (*Felis pardus*) caudal vertebræ .. 1319

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

MOSSE, Capt. A. H., E.I.A.; Saw-scaled Viper (*Echis carinata*) as a tree snake .. 1339

MULLAN, J. P., M.A.; The Food of a Bull-frog (*Rana tigrina*) 1341

NEWNHAM, Lt.-Col. A., I.A.; Hornbills devouring young Paroquets 263

OBITUARY NOTICE; E. W. Oates 651

OSMASTON, A. E.; Eggs of the Large Hawk-Cuckoo (*Hierococcyx sparverioides*) 1330

PARKER, R. N., D. C. Forests; Notes on Cacti in North-West India 1095

PEILE, A. J.; Note on *Macrochlamys* (*Eurychlamys*) *platychlamys* (Blanford), etc. .. 707

PHILIPE, G. W. V. de Rhè: *See* DE RHÈ-PHILIPE, G.W.V.

PITMAN, Lt. C. R. S., 27th Punjabis: The Number of Cubs in a Tiger's litter .. 653

———————————; Do Chinkara (*Gazella bennetti*) drink water? 655

———————————; The Colouration of Tigers .. 657

———————————; A Deformed Head of the Four-horned Antelope .. 658

———————————; The Painted Snipe (*Rostratula capensis*) 666

———————————; Notes on the Southern Migration of Snipe near Calcutta, 1911 684

PAGE

POCHA, Senior Assistant Surgeon, J.P., L.M. & S. and BANNERMAN, Surgeon-General W. B.; Cobra-breeding at Parel 1337

POWELL, A.; Some disputed points in the Anatomy of a common Indian Earthworm. 291

PRALL, Lieut.-Col. S. E., I.M.S.; Falcon and Gulls.. 267

———————————; Nesting of the Osprey or Sea-Hawk 268

———————————; Falcons and their prey .. 680

PRIMROSE, ALEX. M.; Weight and Measurements of a Serow 246

———————————; Weight and Measurements of a Goral.. 247

———————————; The Maroon Oriole (*Oriolus traillii*) 676

PUNDE, A. B., D. F. O.; Migration of Baya (*Ploceus baya*) 675

REMINGTON, G. L.; A Kite's Larder 1082

REVIEWS; "Forty years among the Wild Animals of India," By F. C. Hicks .. 645

———————————; "Medical Entomology," By A. Alcock .. 649

ROBINSON, S. M.; Nesting Notes from Lower Burma.. 261

———————————; Nidification of Davison's Babbler (*Turdinulus exsul*) 1088

RODGERS, A.; The Banting or Tsaing (*Bos sondaicus*). (*With a Text-fig.*) 656

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

ROGERS, C. GILBERT; A Natural Bird-lime 293

SAUNDERS, H. F.; "Poisonous" Lizards in India .. 1341

SCOTT, Lieut. F. B.; Curious behaviour of a Myna .. 256

——————; The Sheldrake (*Tadorna cornuta*) in the United Provinces .. 1089

——————; Intelligence of Ants 1092

SEN, S. K., Asst. to 2nd Imp. Ent.; Asilid Oviposition. (*With a Text-fig.*) 695

SHORTRIDGE, G. C.; Notes on the Time of Appearance and Flight of Eastern Bats .. 1321

——————; The Indian Buffalo (*Bubalus bubalus*) .. 1323

SKINNER, Capt. R. B., R. E.; Seasonal movements of the Himalayan Greenfinch (*Hypacanthis spinoides*) 262

SMITH, EDGAR A., I. S. O.; Description of a new Species of *Acmæa* from Bombay, and Notes on other forms from that locality. (*With a Text-fig.*) 637

SMITH, J. H.; Notes on the Cutch Ammonites. (*With a Map and 2 Diagrams*) .. 709

——————; Notes on Cutch Ammonites. II. (*With 2 Diagrams*) 1347

SMITH, Lieut.-Colonel J. MANNERS; *See* MANNERS-SMITH, J. .. .. ..

SMITH, Major O. A., 27th Punjabis.; Large Common and Banded Kraits.. .. 283

SPALDING, Capt. W. B., R. A.; Jack Snipe in the Cawnpore District 264

PAGE

STONE, F. H. S.; Chinese Gold Fish (*Carassius auratus*) 1100

——————; Horse-Mackerel attacking Jelly Fish 1101

STONEY, R. F.; Swinhoe's Snipe (*Gallinago megala*) near Madras 1083

——————; A branching Palmyra Palm (*Borassus flabellifer*). (*With a Text-fig.*) 1098

TENISON, Lieut. W. P. C., R. F. A.; Distribution of the Cricket (*Schizodactylus monstruosus*) 1091

THEISSEN, F., S. J.; The Fungi of India. Part I. (*With Pls. I.-IV., and Text-figs.* 1-10) 1273

TRENCH, C. CHENEVIX, I.C.S.; Notes on the Indian Chamæleon (*Chamæleon calcaratus*).. 687

TURNER, ROWLAND E., F.Z.S., F.E.S.; A Monograph of the Wasps of the Genus *Cerceris* inhabiting British India. With Notes on other Asiatic Species. (*With Pls. A. & B.*) 476

——————; A Monograph of the Wasps of the Genus *Cerceris* inhabiting British India. With Notes on other Asiatic Species. Part II. (*With Pls. C. & D.*) 794

TYTLER, Major H. C., 17th Infantry; Notes on Butterflies from the Naga Hills. Part I. (*With Pl. A.*) .. 48

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

TYTLER, Major H. C., 17th Infantry; Notes on Butterflies from the Naga Hills. Part II. (*With Pl. B*) .. 588

VENNING, Capt. F. E. W.; Occurrence of Swinhoe's Snipe (*Gallinago megala*) at Myitkyina, Upper Burma .. 269

——————————; Some Birds and Birds' Nests from Haka, Chin Hills. 621

——————————; Snake eating a Snipe .. 689

——————————; Some Notes on the Hatching of the Agamoid Lizard (*Calotes jerdoni*). (*With a Text-fig.*) 690

——————————; A Fly Trap (*Boucerosia crenulata*, Wight & Arn.) .. 707

VIJAYARAJJI, The Maharaj KUMAR SHRI; Goose-shooting in Cutch.. 678

WALL, Major F., I. M. S., C. M. Z. S.; A Popular Treatise on the Common Indian Snakes. Part XVI. (*With Pl. XVI. and Diagram and Maps.*) 1

——————————; Reptiles collected in Chitral. 132

——————————; A New Snake from the Western Himalayas (*Trachischium quinquelabialis*). (*With a Text-fig.*) 201

——————————; Remarks on Two rare Blind Snakes. (*With a Text-fig.*).

——————————; On the Occurrence of the Snake *Dipsadomorphus nuchalis* (Beddome) in Berhampur, Orissa 279

——————————; Is *Lycodon gammiei* (Blanford) an aberrant specimen of *Lycodon fasciatus* (Anderson)? 279

——————————; Remarks on the Greater and Lesser Black Kraits (*Bungarus niger*, and *B. lividus*) 281

——————————; The Development of Embryo in the Eggs of the Oviparous Viper (*Lachesis monticola*), prior to oviposition.. .. 284

——————————; A Popular Treatise on the Common Indian Snakes. Part XVII. (*With Pl. XVII.*) 447

——————————; Rambling Notes on Natural History in Chitral (*With 2 Text-figs.*) 614

——————————; A New Snake, *Psammophis triticeus*, from Baluchistan. (*With 2 Text-figs.*) 634

——————————; The Breeding of the False Himalayan Viper (*Psammodynastes pulverulentus*) .. 686

——————————; Food of the Snake *Rhabdops bicolor* 686

——————————; Breeding of Macclelland's Coral Snake (*Callophis macclellandi*).. 693

——————————; A Popular Treatise on the Common Indian Snakes. Part XVIII. (*With Pl. XVIII., Diagram and Map*). 1009

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

WEBB, M., I. C. S.; Occurrence of the Nukhta or Comb-duck (*Sarcidiornis melanonota*) in Sind .. 685

WHISTLER, H., Indian Police.; Notes on Birds round Rawal Pindi.. 256

———————————; Some winter visitors to Rawal Pindi.. 262

———————————; Occurrence of European Striated Swallow (*Hirundo rufula*), in Kangra 659

———————————; Immature Plumage of Lammergayer (*Gypaëtus barbatus*) 663

———————————; Nestling Plumage of the Great Stone Plover (*Esacus recurvirostris*) 1074

———————————; The Himalayan Greenfinch (*Hypacanthis spinoides*, Vigors) 1074

———————————; The Long-tailed Grass Warbler (*Laticilla burnesi*, Blyth). 1080

WHITEHEAD, Major J. H., 93rd Burma Infantry; Woodcock (*Scolopax rusticula*) in South Andamans 1085

PAGE

WHITEHEAD, Captain C. H. T.; Notes on the Birds of Sehore, Central India, with Special Reference to Migration 153

WILLIAMSON, W. J. F.; Occurrence of the Fantail Snipe (*Gallinago cœlestis*) in Siam.. 269

WILSON, Major ALBAN, 8th Gurkhas; Some notes from the Abor Expedition. (*With a Text-fig.*) 1068

WITT, D. O., I. F. S.; Occurrence of the Fantail Snipe (*Gallinago cœlestis*) in Siam . 269

WROUGHTON, R. C., F. Z. S.; Further Notes on some Mammals from Lower Sind .. 175

———————————; Some New Indian Rodents. (*With a Plate and 2 Text-figs.*) 338

———————————; Some New Indian Mammals. (*With a Text-fig.*) 767

See BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA.

YATES, Capt. G. A. HASSELS—*See* HASSELS-YATES, Capt. G. A.

YOUNGHUSBAND, A. D., C.S.I., I.C.S., Commissioner in Sind. Letter from, on Cruelty to Wild Fowl in Sind 1356

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ERRATA.

Cover of Part 1, line 9, *for* on *read* from.
,, ,, ,, 1, last page, line 4, for *Podicepes* read *Podicipes*
,, ,, ,, 1, ,, ,, ,, 5 ,, *albipenis* read *albipennis*.
,, ,, ,, 1, ,, ,, ,, 30 ,, *polyites* read *polytes*.
Page 29, line 22, *for* Dr. Aitchinson *read* Aitchison.
Contents of Part 1, line 32, *for* Pantail *read* Fantail.
,, ,, ,, 1, ,, 35, *for* page 272 *read* 271.
Page 58, line 19, for *Stibochiana* read *Stibochiona*.
,, 64, lines 8 and 9, for *Cirrhochroa* read *Cirrochroa*.
,, 64, line 12, for *Angynnis* read *Argynnis*.
,, 95, ,, 1, for *Pyrrhulanda* read *Pyrrhulauda*.
,, 98, ,, 38, for *Perenopterus* read *percnopterus*.
,, 99, ,, 31, *for* Mertin *read* Merlin.
,, 157, ,, 15, *for* Ballon's *read* Baillon's.
,, 157, ,, 17, *for* Crane *read* Crake.
,, 157, ,, 29, for *phœops* read *phœopus*.
,, 157, ,, 42, *for* March *read* Marsh.
,, 159, ,, 7, for *Marecca* read *Mareca*.
,, 159, ,, 13, for *Querquedecula* read *Querquedula*.
,, 159, ,, 25, for *ferrina* read *ferina*.
,, 161, ,, 36, for *supercilliaris* read *superciliaris*.
,, 164, ,, 24, for *Franklina* read *Franklinia*.
,, 165, ,, 34, for *maderapatensis* read *maderaspatensis*.
,, 166, ,, 36, for *torcuatus* read *torquatus*.
,, 180, ,, 29, for *Recurirrostris* read *Recurvirostris*.
,, 180, ,, 33, for *bruneicephalus* read *brunneicephalus*.
,, 180, ,, 34, for *Fulca* read *Fulica*.
,, 181, ,, 22, for *strepserus* read *streperus*.
,, 181, ,, 23, for *penolope* read *penelope*.
,, 181, ,, 28, for *clyptea* read *clypeata*.
,, 181, ,, 38, for *Syrhaptes* read *Syrrhaptes*.
,, 184, ,, 8, *for* Wadell's *read* Waddell's.
,, 184, ,, 8, for *Barbax* read *Babax*.
,, 184, ,, 8, for *Wadelli* read *Waddelli*.
,, 185, ,, 8, for *Propassers* read *Propasser*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Page 227, line 4, for *hirtellas* read *hirtellus*.
,, 266, ,, 16, for *strata* read *striata*.
,, 299, ,, 15, for *Catapsilia* read *Catopsilia*.
,, 406, ,, 41, for *elllioti* read *ellioti*.
,, 422, ,, 43, for *Dascochæta* read *Dascoehæta*
,, 423, ,, 5, for ,, ,, ,,
,, 431, ,, 15, for *Spodopotera* read *Spodoptera*.
,, 444, ,, 4, for *Hypoprigea* read *Hypoperigea*.
,, 588, ,, 24, *for* Z *read* L.
,, 594, ,, 1, for *Mejisba* read *Megisba*.
,, 601, ,, 8, *for* Hypolijæena *read* Hypolycæena.
,, 614, ,, 21, for *valgaris* read *vulgaris*.
,, 661, ,, 35, *for* frogs *read* fry.
,, 704, ,, 32, for *molliusellus* read *molliusculus*.
,, 752, ,, 1, for *eyrypylus* read *eurypylus*.
,, 800, ,, 27, for *allopicta* read *albopicta*.
,, 878, ,, 4, *for* Part III, *read* IV.
,, 972, ,, 35, *after* agenor *insert* (♀ d, butlerianus, Roth.,
(♀ d, alcanor, Cr.)
,, 984, ,, 46, (*Phengaris*) *sarta* lower to line 48.
,, 984, ,, 47, *atroguttata*, Dohn. ,, ,, ,, 50.
,, 988, ,, 32, *for* ephyrus *read* Zephyrus.
,, 989, ,, 13, *for* kohmensis *read* kohimensis.
,, 989, last line, *for* S *read* An.
,, 990, line 26, *for* Apporosa *read* Apporasa.
,, 992, last line, *for* Sounguva *read* tounguva.
,, 998, line 40, *for* Cnaiolade *read* Coladenia.
,, 1008, ,, 39, *for* p. 573 *read* p. 578.
,, 1133, *delete* Fig. 21 and block (see under *Pieris brassicae* in The Common Butterflies of the Plains of India, No. 1, Vol. xxii.)
,, 1135, at bottom of *delete* key under Genus *Huphina* and *insert*—

A. Underside hindwing : veins more or less broadly bordered with or delated with, dusky black ..... *nerissa*,
(Pl. I, figs. 61 ♂, 61 ♀.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

B. Underside hindwing: veins not bordered with dusky black ..... *remba.*

Page 1136, line 12, *for* J. *read* I.
,, 1136, ,, 21, for *Anaphœis* read *Pareronia.*
,, 1140, ,, 26, *for* J. *read* I.
,, 1144, explanation of Plate I, *for* Pereronia hippa *read* Pareronia pingaṣa.
,, 1144, ,, ,, *add* 63 A. Pareronia hippia ♀.
,, 1145, line 38, *for* strigoe *read* strigæ.
,, 1147, ,, 22, for *Cratœva* read *Cratœva.*
,, 1148, ,, 8, *for* narrows *read* narrow.
,, 1150, ,, 7, *for* broad base-short *read* broad-based, short.
,, 1150, ,, 37, for *Dirtera* read *Diptera.*
,, 1152, explanation of Plate J, fig. 65 b *is* Ixias mariannæ and *not* I. pyrene.
,, 1156, line 15, *for* booklets *read* hooklets.
,, 1169, ,, 21, for *garetta* read *gazetta.*
,, 1209, ,, 22, for *swinhoii* read *swinhoei.*
,, 1218, ,, 13, *for* G read L.
,, 1304, 2 lines from the bottom, for *nepalensis* read *neglecta.*
,, 1306, line 18, *for* pregnacious *read* pugnacious.
,, 1310, ,, 28, *for* flock *read* flocks.
,, 1321, ,, 11, *for* small *read* large.
,, 1321, ,, 13, above *Megadermatidae* insert *Hipposiderus* (small)- - - - late - - - - similar to *Rhinolophus.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

पुस्तकालय
गुरुकुल कांगडी विश्वविद्यालय
हरिद्वार

JOURNAL
OF THE
Bombay Natural History Society.

Oct. 1911. Vol. XXI. No. 1.

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

Illustrated by Coloured Plates and Diagrams.

BY

Major F. Wall, I.M.S., C.M.Z.S.

Part XVI with Plate XVI and Diagram and Maps.

(*Continued from page 953 of Volume XX.*)

Introductory remarks.—The subjects of this paper belong to the *Boidæ*, a family comprising the boas, and the pythons. There are many representatives scattered over all five Continents. These snakes are characterised by the possession of rudimentary hind limbs, and a rudimentary pelvis, the termination of the former being more or less visible as claw-like processes situated on each side of the body in a fold or dimple above the anus.

The family is divided into two sub-families, *viz.*, *Pythoninæ* in which there is a bone (the supraocular) distinct from the frontal forming the roof of the orbit, and *Boinae* in which the frontal alone forms the orbital roof. The latter includes 13 genera of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

which *Eryx* is one. The genus *Eryx* of which *jaculus* is the type has seven species inhabiting North and East Africa, and Central and Southern Asia. Three of these, *viz.*, *jaculus*, *conicus*, and *johni*, occur within Indian limits.

ERYX CONICUS (SCHNEIDER).

RUSSELL'S EARTH SNAKE.

History.—* The first certain reference to this snake was made by Russell who described and figured it unmistakeably in 1796. It is not certain, whether the *Vipera orientalis* referred to by Seba in 1734, or the *Serpens indica* of Boiquatraza, are identical with *E. conicus*, though this may be the case.

Nomenclature—(*a*) *Scientific.*—The generic name appears to be derived from the Greek "eruo" I drag along, probably in allusion to the feeble powers of progression of the type *jaculus*. Daudin introduced the name in 1803. *Conicus* from the Latin conical, suggested itself to Schneider in 1801, on account of the peculiar short and conically shaped tail.

(*b*) *English.*—The Common Earth Snake suggests itself, but the fact that John's Earth Snake (*E. johni*) is also common, deters one from accepting this as appropriate. I think Russell's name should be associated with it, and Linné's name with its close ally *jaculus*.

(*c*) *Vernacular.*—It is confused by natives so frequently with John's Earth Snake, that many of the names in use apply to both species. Russell says about Vizagapatam it is called "padain cootoo," "mondi poda," and "manooli pampoo" (pamboo?). The last is certainly one of its commonest names in S. India, and is the Tamil for "earth-dweller." Other common names are "manoo pamboo" or earth snake, "mannary," "mannooly," or mannooni" malayalanm words meaning "sand or earth eater." "Mandally" is another, and the one in frequent use about Malabar. I have known it called "kuley pamboo" or mud snake and Russell also mentions "pedda poda." In Mysore its Canarese name is "itallay havu" or "two-headed snake." Mr. Millard tells me that at Ratnagiri it goes by the name of "kander," and about

* Ind. Serp., Vol. 1, p. 5, pl. IV.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Bombay as "kakria." Mr. D'Abreu tells me the Hindi name is "thut-thur-samp" or "snouted snake." In the Punjab, and in Bengal it is often called "do muha" or "two-mouthed" (Hindi, and Punjabi), but this is more appropriately the name for *Eryx johni*.

General characters.—It is of a markedly stout habit, the body being short and heavy, and the tail short. The body is broader in its transverse direction than its vertical, and stoutest about the middle. It attenuates somewhat, and very gradually in both directions, passing almost insensibly into the head so that there is but slight indication of a neck. It is rough dorsally owing to the keeled condition of the scales, and this roughness becomes more pronounced posteriorly. At each side just above the vent is a small curved claw-like process directed downwards in the ♂ and a small pointed process directed backwards in the ♀, which indicate the termination of the rudimentary hind limb. This is far more developed in males, and is frequently supposed to be the male copulatory organ by those not conversant with ophiology. In females the development of this process is so small that it is usually overlooked* leading to a popular belief that, it is the male only that bears it, hence the idea, no doubt, that it is the male sexual organ. Most of the limb is concealed within the muscular tissues but if dissected out by competent observers, the analogues of many of the bones seen in the limbs of other vertebrates can be traced up to its origin in the rudimentary pulvis. The head is moderately elongate, rounded evenly from side to side, and has a more or less pronounced temporo-occipital eminence, on either side. The snout is long, rounded laterally owing to a complete absence of any canthus rostralis, and broadly rounded in front. It overlaps the chin, to an extent often equalling the diametre of the eye and is not provided with the transverse ridge in front, which is seen in both the other Indian representatives of this genus, nor has it the groove beneath the chin, (mental groove) which is characteristic of these two species (*jaculus* and *johni*). The eye is very small, its diametre being only about one-third the length of the snout. Its

* Nicholson (Ind. Snakes, p. 3.) says the ♂ alone has them.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pupil is vertically elliptical, and its iris beautifully speckled with gold. The nostril is slitlike, and placed high on the snout. The tongue is pale at the base, but blackish at the tips. The tail is short, and tapers very rapidly so that it is conical in shape. It is even rougher above than the hinder part of the body.

Colouration.—The under parts are buff, uniform, or with but little trace of mottling. In the flanks there is a mottling of brown, sometimes of a light shade, sometimes as deep as chocolate. At first very fine this mottling becomes coarser as it ascends the flanks, and then vertical bars of the ground colour pass up to the spine. These bars are much narrower than the intervals. When they meet over the back large somewhat irregularly squarish blotches are formed which proceed from the nape to the tail tip. More often the bars of the two sides alternate, and an irregular dark patchy confluent pattern results. The head is light above with sometimes dark speckling especially about the lips, and a dark irregular stripe passes from the eye to the gape. Dr. Annandale*, who captured a mother and young, says the latter are more brilliantly coloured.

Identification.—Russell's earth snake is very like Linné's earth snake (*jaculus*), so much so that I have no doubt the two have been confused repeatedly in the Punjab where they are associated. It was only in 1909 in this journal that I reported the occurrence of *jaculus* for the first time within Indian limits, the specimen being captured at Jhelum. Whether it is as rare as this single record might lead one to suppose, remains to be seen.

The dual association of small head scales, with ventrals so narrow that they are only twice or little more than twice the breadth of the last costal row, suffices to pronounce the snake an *Eryx*. *Conicus* differs from the other two Indian species (*johni* and *jaculus*) in having no groove beneath the chin, and no angular transverse ridge on the rostral shield, so that the identification is extremely easy. A similar specimen with a conical tail, mental groove, and angular ridge on the rostral would prove to be *jaculus*.

Dimensions.—The largest specimen I know of was a gravid ♀

* Mem. As Soc., Bengal. Vol. 1. 10, p. 193.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

killed in Trichinopoly by the Revd. C. Leigh, S.J., which he said taped 2 feet 9 inches. I saw another large specimen (not of local origin) in the St. Joseph's College collection, Darjeeling, that measured 2 feet 7 inches. The largest I have had myself were 2 feet 4¾ inches, 2 feet 3¼ inches, and 2 feet 1½ inches. Specimens over 2 feet are not common.

Haunts.—It is generally stated to be a desert snake, but it is by no means confined to desert tracts. It was a very common snake in Malabar, where the annual rainfall was about 150 inches, and the soil supported a particularly luxuriant vegetation. Father Dreckman tells me he has frequently seen it in the Western Ghats at an elevation of 2,000 feet (Khandalla), a locality favoured with 200 inches annual rainfall and a flourishing forest growth.

Like the rest of its genus it is an earth snake, but though it does not possess even a rudimentary indication of the transverse ridge which all the other members of the genus have developed, and which they use for digging purposes, it does not appear to me to suffer from the want of it, for it burrows into loose soil quite as easily, and expeditiously as *Eryx johni*, the species which exhibits this ridge in its most exalted state of development. Possibly were it to test its powers in harder soil against John's earth snake, the latter would show its superiority.

Though an earth snake its life is by no means completely subterranean. Were it so, doubtless by now it would have acquired, or be acquiring the condition of ocular degeneration seen in the blind snakes (*Typholidæ*), a family in which the eyes have undergone a devolution process brought about by a protracted residence in darkness.

From what I know of *conicus* I feel confident that a considerable period of its life is spent either above the soil, or in the most superficial layers, into which light is admitted and by its stimulus the function of the eye has been preserved. As a result this organ beyond being small, is quite as well developed, and vision seemingly quite as good, as in colubrines, and other highly organised representatives of the order.

The specimens I have kept myself, and that I have seen in captivity elsewhere I have frequently noticed are often to be seen

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

above the soil which has been provided for them to conceal themselves beneath, and in some cases where no earth was given it appeared to thrive just as well without it, and for long periods. The only specimen I remember not having seen for many days was missing when I came to investigate! It had evidently contrived to reach the top of the sides of the box in which I had placed it and so effected its escape. A large number of those brought in to me were reported above the ground, and many of those were discovered in broad daylight. It is also evident that it must have been above ground, and in daylight in the instances where it had managed to capture squirrels. On the other hand I have frequently had specimens brought in that were found beneath the soil, their refuge being disturbed by human earth operations. In these cases it appeared to have retired from active life. In Cannanore it was in the hot and dry weather that it was most often abroad, being as common in that season, as it was scarce in the monsoon.

Disposition.—Russell's Earth Snake is a dull, phlegmatic creature, and a most uninteresting occupant of the vivarium. The ones I had in captivity were generally to be seen lying above the earth, or only partially buried, and remained motionless for hours together. They were not easily roused, except when the food was offered them, and then they showed an interest in life not seen at other times. I have played with many specimens, but it has a nasty uncertain temper, and one has to handle it with caution to avoid being bitten. It will lie on the ground motionless, take little notice of teasing, and just when one begins to think the reptile has no vice in its composition, and will submit to a touch, it suddenly springs forward, and implants its teeth into one's hand, and it can bite with considerable force. Although careful in my dealings with it, I have been bitten several times, the suddenness of the assault giving me no chance to withdraw my hand, as one can do with so many other snakes, when familiar with their ways. Russell remarks of one he had sent him that it bit ferociously. Mr. Boulenger* says the one he kept had a fierce temper, and Father

* Faun. Brit. Ind. Rept., p. 247.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Dreckman tells me that he thinks it is one of the most vicious members of all snakedom, ready to snap at anything at a moment's notice. He was bitten by the first snake that he ever encountered in this country which happened to be a *conicus*. Dr. Henderson says that in his experience it is a sluggish snake, but occasionally it strikes out fiercely when irritated. Mr. D'Abreu tells me he kept a pair for a long time. He says when first captured it is very fierce, biting readily when touched, but after a little handling it gets quite tame, and never bites no matter how much it is handled. Certainly the specimens which accompany many jugglers allow themselves to be handled without betraying any malice. I have known some specimens when irritated, sulk in a most determined manner, remaining quite motionless, and refusing to offer any malice. Sometimes indeed it hides its head beneath its body, and remains so for many minutes. It will often flatten its body to the ground when alarmed, like many other snakes do.

Habits.—Whether this snake is in the main nocturnal I do not know. At any rate it is very frequently abroad by daylight, and even in the midday glare of the hot weather, frequently establishes itself beneath trees in S. India where it lurks for the purpose of catching the squirrels (*Funambulus palmarum*) when they descend. With this object I believe it partially buries itself, and patiently awaits the chance of a squirrel coming within reach, and the chances are not so remote as one might imagine who does not know Southern India, for the squirrels there almost amount to a pest. They are always on the move, and frequently descend, and wander about beneath the trees. In this connection I believe whatever the original function of the keels on the scales of snakes and lizards may have been, that they are of material advantage to a snake like *Eryx conicus*, for they undoubtedly assist its effectual concealment. As the snake noses its way through the surface soil, the particles of earth lodge in the grooves formed between the keels on its back and serve to conceal its serpentine form. Were the body smooth the particles would roll off, and expose more or less of the snakes body, unless buried so deeply as to hamper its movements when the quarry came within reach. This function

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of the keels in snake's, is also seen in desert snakes like the horned vipers (*Cerastes*) that lie partially concealed in the sand. The movements of Russell's Earth Snake are laboured, and slow, and it is impossible for the creature to proceed at any pace other than a crawl. The reason for this is apparent when the snake is laid on its back. The shields on the belly are very narrow compared to those of colubrines and vipers. They only occupy some two-fourths of the middle of the belly breadth, and as the ribs are attached to them, those bones are very much bowed, leaving one-fourth of the body on each side, without a support.

As a snake moves on its ribs, the body which in this snake is unusually massive has only half its breadth supporting it during progression.

Food.—Its food is almost exclusively of a mammalian order. Those I had in captivity in Trichinopoly persistently refused frogs, and lizards, and my servant told me their usual fare was squirrels (*Funambulus palmarum*). Following his advice I gave them squirrels whenever I could get them, and they were always taken eagerly.

The distension of a snake about 20 inches long after swallowing a squirrel may well be imagined, but although the process of incorporation was a protracted one, no misadventure occurred. On two occasions in Cannanore specimens were brought to me that had been discovered in the act of devouring full grown squirrels, in one case the snake was only 1 foot 4½ inches long! A third specimen contained a relatively large mammal in its stomach which appeared to be a squirrel. Mr. D'Abreu fed his specimens on mice which they ate with avidity, and grew very fat upon. A captive specimen in Madras Museum ate in one year 57 mice, another 65 rats, and a third 51 mice, and 1 rat in the year. A specimen brought in to me at Cannanore had eaten a large frog (*Rana tigrina*), but reptiles are not usually acceptable. Mr. D'Abreu says that a lizard of the genus *Calotes* was very promptly despatched by one of his captive specimens but no attempt was made to eat it subsequently. Mr. Millard tells me that one in our Society's room tried to eat a young snake (*Tropidonotus piscator*), and the Revd. J. Castels, S.J., told me of one he had in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

captivity that killed a green whipsnake (*Dryophis mycterizans*) with which it was quartered.

Like other boas it kills its victims by constriction, and the strength of its body is such that the life is crushed out of a squirrel or mouse in a few seconds, and until life is extinct it does not commence swallowing.

The sexes.—Of the 18 specimens I sexed in Cannanore 9 were ♂ ♂, and 9 ♀ ♀, showing that the sexes are evenly balanced. The ♀ appears to grow distinctly larger than the ♂. I never had a male reaching a length of 2 feet, though I have had 3 ♀ ♀ exceeding that length. The largest record I have already alluded to was also a ♀ Mr. Leigh's 2 foot 9 inch. specimen. The development of the tail differs in the sexes, the length being in favour of the ♂, in which this appendage accounts for from one-eleventh to one-fourteenth the total length of the snake. In the ♀ it is from one-fourteenth to one-seventeenth the total length. There appears to be another sexual difference judging from my notes, and this is in the costal rows which number in midbody 47 to 51 in the ♀, and from 43 to 48 in the ♂.

Breeding.—Our knowledge of the breeding is not what it ought to be when one considers what a common snake it is, and how well it thrives in captivity. In Southern India the season of matrimonial intercourse is about November, but we do not know whether the snake is oviparous or viviparous. I had a gravid ♀ killed in camp on the 7th of December at Cannanore within which were 6 largish eggs, perhaps an inch long. Mr. Leigh told me of one he had in Trichinopoly that contained 16 eggs about half an inch in length, in early January. Dr. Annandale* however mentions a ♀ specimen said to have been found with 3 young ones at Ramanad in August. The smallest specimen I know was a ♂ $8\frac{7}{8}$ inches long in November, but whether a hatchling or not I could not say. One noticeable feature in the young is that the navel is placed very much further away from the anus than is the case with colubrine snakes. I have counted no less than 43 ventrals intervening.

* loc. cit.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sloughing.—A few notes were made in Madras a few years back. One specimen desquamated on the 18th of April, 18th of May, 6th of August, and 9th of October in 1895. Another (perhaps the same snake) shed its skin on the 30th of April, 4th of June, 22nd of July, and the 4th of October 1896. Another (perhaps the same specimen) cast its slough on the 13th of June, 23rd of September, and 24th of December 1897.* Like our other Indian representatives of its family, its ecdysis occurs about 4 times a year at rather irregular intervals.

Parasites—I have paid very little attention to this subject, but it is almost certainly infested with Entozoa like the python, and most other snakes. I have found ticks attached to its skin, and those though not identified are almost certain to prove a species of *Aponomma*. A blood parasite the *Hæmogregarina cantliei* has been discovered inhabiting the blood cells.†

Distribution—Peninsula India from the base of the Himalayas to Cape Comorin, and Northern Ceylon. In the North-West it extends to Sind and Baluchistan, and in the North-East to Behar and Lower Bengal. Major H. H. Magrath sent me a fragment of a skin of an *Eryx* from Bannu that might be this species or *jaculus*, more probably the latter.

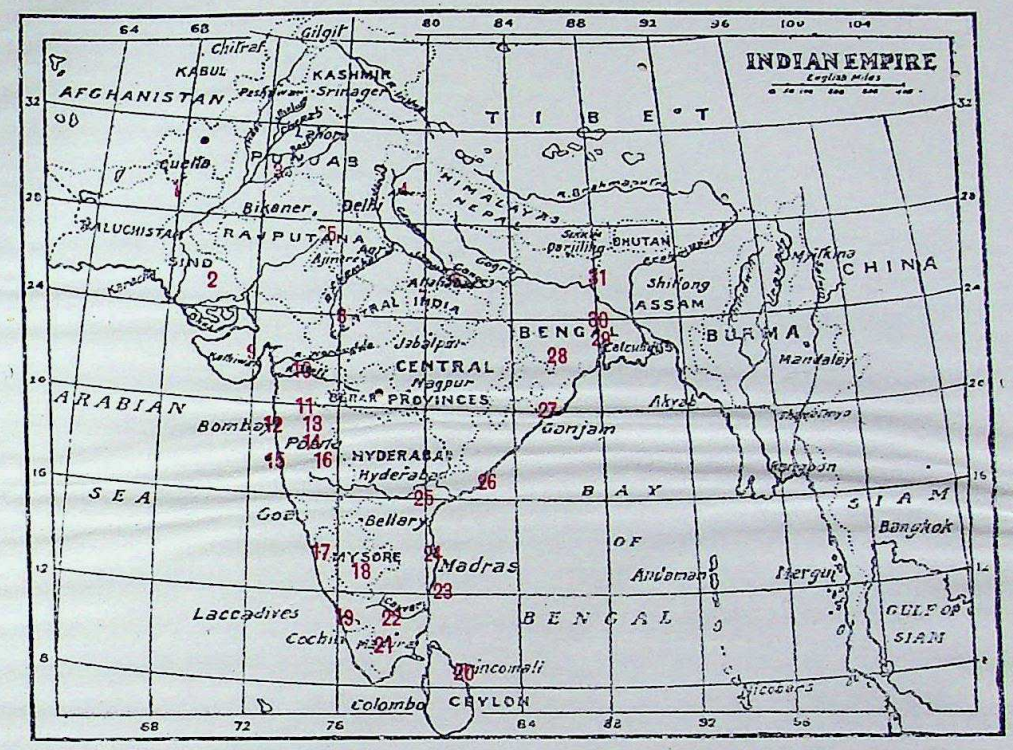
It is a snake of the Plains, but like many other species ascends some distance into hilly regions. There are specimens in the British and the Indian Museums of Colonel Beddome's collecting from the Anamallays, altitude not specified. Father Dreckman has met with it in Khandalla, (*circa* 2,000 ft.) and there is a specimen from Poona (*circa* 3,000 ft.) in our Society's collection. In the Indian Museum there is a single example from Palair in the Naini Tal District, but the altitude is not recorded. Von Schlagentweit's specimen in the British Museum is reported from Sikkim—a most improbable locality—though of course it is possible it may have been acquired from a juggler, this snake being seen so frequently in the possession of this nomadic class.

The accompanying map shows the precise localities from which it has been reported.

* This valuable information was communicated to me by Dr. J. R. Henderson.
†Manson. Trop. diseases 1907, p. 819.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



DISTRIBUTION OF *ERYX CONICUS*.

B. M. implies British Museum, I. M. Indian Museum, Bo. M., Bombay Society's Collection, F. W., the Writer.

1. Fort Munro, Baluchistan (Bo. M.). 2. Sind (Murray & B. M.). 3. Multan (Bo. M.). 4. Palair, Naini Tal District (I. M.). 5. Gwalior (B. M.). 6. Allahabad (I. M.). 7. Saugor (Bo. M.). 8. Neemuch (Bo. M.). 9. Rajkot, Kathiawar (F. W.). 10. Khandeish (Bo. M.). 11. Nasik (Bo. M.). 12. Bombay (Bo. M.). Khandalla (Dreckman). 15. Ratnagiri (Millard). 16. Hingoli, Deccan (Bo. M.). 17. Malabar (Dumeril et Bibron & F. W.) 18. Anamallays (B. M. & I. M.). 19. Travancore (Ferguson). 20. Trincomalee, Ceylon (Bo. M.). 21. Ramnad (I. M.) 22. Trichinopoly (F. W.). 23. Pondicherry (Dumeril et Bibron). 24. Madras (Russell & B. M.). 25. Godavary (Blanford). 26. Vizagapatam (Russell). 27. Chandbatty, Cuttack District (I. M.). 28. Chota Nagpur (I. M.). 29. Singbhum (I. M.). 30. Manbhum (I. M.). 31. Behar (D'Abreu *in epistola*).

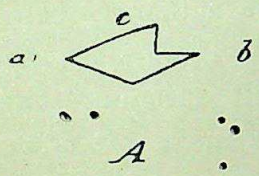
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Lepidosis.—*Rostral* much broader than high, not ridged transversely. Touches six shields, the anterior and posterior nasals and 1st labial. *Internasals.*—Absent. The small scales on the top of the head become first mammillated, and then carinate as they proceed backwards. *Nasals.*—Two, an anterior and a posterior with the nostril between. The eye is surrounded by small scale only, and one or two rows of scales intervene between it and the supralabials. *Supralabials.*—12 to 15, the anterior largest, and distinctly higher than broad. *Mental.*—Small. *Infralabial.*—17 to 20, the anterior largest, much deeper than broad, the first do not meet behind the mental. *Costals.*—Two heads-lengths behind the head 38 to 46, midbody 40 to 53, two heads-lengths before vent 24 to 35; keeled (except the 7 to 10 lowest rows anteriorly, 9 to 13 in midbody, and 2 to 6 posteriorly). The keels are peculiar, seen in profile they gradually incline upwards from the base of the scale to a point about one-third from the apex when they decline to the apex. In the most posterior scales they suddenly decline from the summit, so that they appear in outline as shown in our diagram. The dorsal scales are a shade longer than broad, those in the last 3 subcostal rows progressively increase in size, and their breadth exceeds their length, the last being ½ or a shade less than ½ the breadth of the ventrals. *Ventrals.*—Narrow, 162 to 186. *Anal.*—Divided into 3 parts, a larger median, and two small lateral portions. *Subcaudals.*—17 to 24, frequently entire, but usually some, often many divided.



Dentition.—The *maxillary* teeth number from 13 to 15, the first 3 progressively increase, and the posterior gradually decrease in length. The *palatine* are 5 in number, and the *pterygoid* 14 to 15. The *mandibular* array number 20, the anterior are largest, and these progressively decrease to about the 7th tooth, after which they are subequal.

Our plate is good except that the neck is shown far too evident and the nasal shields are shown in contact, whereas they are really separated by a pair of internasals. The irregularity of the pattern is well rendered, and in no two specimens will this be found quite

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the same. In many specimens in life so much mud or earth adheres to the skin, that the pattern is often much, if not completely, obscured. In spirit specimens, consequently, the marking is much better seen.

ERYX JOHNI (RUSSELL).

JOHN'S EARTH SNAKE.

History.—This was first described and figured by Russell* in 1801, from an adult specimen sent to him by the Revd. John of Tranquebar. The same author figured a young example† (from a painting given to him by Captain Hardwick taken from a specimen collected in Bengal. ?)

Nomenclature.—(*a*) *Scientific.* The specific name was given by Russell in honour of the Missionary who presented him with the original of Plate XVI of his work.

(*b*) *English.*—I think John's Earth Snake, or John's boa, the most appropriate name to apply to it.

(*c*) *Vernacular.*—Russell tells us on John's authority that it is called "erutaley nagam" about Tranquebar. This name, and "eruthally pamboo," both of which are Tamil, meaning "two-headed snake," are in common use in Southern India. It is also called "manooli" or "earth dweller" in the same part of India. On the Malabar Coast, and also in other parts of S. India it is sometimes called "mandalli," and in Mysore the Canarese name for it is "itallay havoo" which also means "two-headed." In Lower Bengal the Hindi name for it is "do muha" or "two mouthed," and the same application is in use in the Punjab generally. A well educated native told me that about Peshawar it is known as "landai," the Pushtu word for "short," but I am very dubious about this, believing that this name is correctly applied to either of the two little blind snakes, *Typhlops braminus*, or *Glauconia blanfordi*, both of which are very diminutive, and sometimes also called two headed snakes.

General Characters.—The snake is of remarkably even calibre in its whole length, showing little if any constriction at the neck.

* Ind. Serp., Vol. II, Plate XVI.

† Loc. Cit., Plate XVII.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The body is very stout, heavy, and muscular. Its transverse diameter very appreciably exceeds the vertical, and there is a groove along the spine. It is covered with numerous, small, smooth or nearly smooth scales. The claw-like termination of the rudimentary limb is situated as in *E. conicus*. The head is covered with scales little larger than those on the back. The broad muzzle is furnished with an angular horizontal ridge with which the creature burrows, and this ridge is more pronounced in this than in any other species of the genus. The upper jaw projects beyond the chin to an extent equal to the diameter of the eye. The eye is very small, its diameter being about one-third the length of the snout. The pupil is vertically elliptical, and the iris is spotted with ruddy gold. The nostril is slit-like, and is placed between two enlarged shields rather high on the snout. The tongue is yellowish basally, black at the tips. Beneath the chin there is a longitudinal furrow (the mental groove). The tail is short and stumpy, its extremity rounded, and general form very similar to that of the head, hence the almost universal belief among natives that the snake is two-headed. Indian jugglers, who so frequently have this snake among their stock in trade sometimes improve upon nature, and mutilate this stumpy appendage, making marks to suggest eyes, and cutting a transverse incision at the extremity which leaves a scar suggesting a mouth. The public, who for the most part prefer to keep a respectful distance from any snake, fall easy victims to their own credulity, and too often go away under the firm conviction that they have seen a head at each extremity.

Colour.—The adult specimens I have seen have been either uniformly coloured, of a lightish brown, ruddy-brown, or dark olivaceous-brown, or marked with fine dark reticulations arranged so as to form cross bars. The cross bars are ill defined, but when present at all most conspicuous posteriorly, and on the tail especially. Many specimens in life are so sullied with earth adhering to their scales, that any marks are obscured till the snake is washed. Immersion in spirit makes any marks very apparent. The belly is of a lighter shade than the back, and often more or less mottled with blackish.

The young are very different, so much so that many people who

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

are quite familiar with the adult fail to recognise the most juvenile specimens as of the same species. According to Russell the young one figured by him was coral red, but Dr. Annandale uses the expression brick-red for his specimens. A young specimen, about 14 inches long from Multan in our Society's collection, is sandy-red and when looked at closely the scales are seen to be pale buff with ruddy outlines forming a very fine reticulation. In Russell's specimen there is a dorsal series of large black blotches from the nape to the tip of the tail. In the Multan specimen there are broad cross-bars of a ruddy-brown hue, on the tail, and posterior body which disappear anteriorly. The belly is buff heavily dappled with darker tones.

Identification.—The snake once seen should never be mistaken, however both Europeans and Natives confuse it with *E. conicus.* As mentioned under *conicus* the genus is very easily recognised. *Johni* differs from the other species in its blunt tail. It also has a larger number of scale rows at midbody, *viz.*, more than 53.

Dimensions.—Adults rarely exceed 3 feet. The largest I know of is in the British Museum and measures 3 feet 3 inches.

Haunts.—Like Russell's earth snake John's boa is described as a desert snake, but the remarks I have made under the former apply equally here. Father Dreckman tells me it is by no means uncommon about Khandalla in the Western Ghats (circa. 2.000 feet). He tells me further that he has always found it close to water, though not actually in that element, and that it is a very thirsty creature he having counted more than 120 gulps taken at a single drink.

It is probably much commoner than Museum specimens would make it appear, for it is one of the usual subjects of exhibition in an Indian juggler's stock in trade.

It is called an earth snake, and is frequently found beneath the soil, but how much of its life is spent beneath the ground it is impossible to know. Though the eye is small it is in other respects as perfectly developed as in Colubrine, and other snakes. This leads one to infer that the subterranean life is one that has been acquired in recent times, or that it spends part of its life above the surface soil. There is no doubt that it is frequently

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

encountered above ground, and I am inclined to think this is the result of its own inclination rather than from force of circumstances, such as a water logged soil in the rains, or the desire for water to assuage its thirst in long drought.

The remarks made upon Mr. John's captive specimen makes it appear that it was usually lying above the earth, and it has certainly frequently been my experience to see other caged specimens lying visible, though they were supplied with earth, in which they might have concealed themselves. It would be interesting to note in future, the climatic and other conditions when a specimen is met with either above or beneath the soil.

Habits.—I know very little of this snake in its natural haunts, so that most of my observations have been made from specimens in the hands of jugglers, or in captivity elsewhere. I always found it a particularly inoffensive creature, but thought that its gentle disposition might merely be the result of its captivity, and a reconciliation to the repeated handling it had received. However more than one good observer, who is better acquainted with the snake in nature, has remarked to me on its extremely placid nature at all times. Russell tells us that Mr. John kept one for a year in a chatty of earth. It generally lay coiled up with its head under its belly, was not easily roused, and never showed a disposition to bite. Father Dreckman, who has encountered many, tells me that he has never met with a more harmless creature, even freshly caught, he says, it never attempts to bite, and although he has handled many under natural conditions none ever used its teeth. Dr. Henderson too remarks that it is the gentlest of snakes allowing itself to be handled without any attempt at self defence. One I found in Trichinopoly lying on some loose soil, took no notice of me, allowed me to move it about with a stick without showing any signs of annoyance or attempting to escape, and was altogether so lethargic that I thought it must have been mortally damaged though I could find no trace of an injury. Those in the possession of snake men usually lie where they are placed on the ground, or make aimless movements without any attempt to conceal or bury themselves. From what has been

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

already said, one will readily imagine that it is a very uninteresting reptile in captivity. Perhaps its chief interest lies in the deft and speedy manner in which it can bury itself in the earth when so disposed, but one is lucky if one witnesses this performance. It noses its way into the earth, by using the transverse ridge on its snout as a digging implement. The præmaxillary bone which has to bear the strain of these operations is extraordinarily developed, surpassing in size and strength that of any other snake that I know. The only other interest attaching to the snake in the vivarium is its method of killing its prey.

Its movements are in keeping with is phlegmatic disposition, and clumsy corporeal habit. Progression is slow, and laboured and under no degree of stimulation even amounting to cruelty, does the creature seem capable of bestiring itself. The reason seems to be on account of its very narrow ventral shields and I have already remarked upon the handicapping influence these must have upon progression when dealing with the last species (*conicus*).

Food.—I have no knowledge of its tastes in a state of nature, but from the avidity with which it devours squirrels, rats and mice in captivity one may assume that it is very partial to a mamalian fare. One in Madras ate in one year 16 rats and 3 mice, another 4 squirrels, 28 rats and 4 mice, and another 17 rats. How it manages to capture such creatures under natural conditions it is difficult to understand unless as I think most probable it burrows into and invades their subterranean abodes where it can effectively bring them to bay. Once captured, it employs the same means of killing its victim as the python, encircling it, and crushing the life out of it. Its massive, and muscular body makes the accomplishment of this object an easy matter, and a speedy one. Major O. A. Smith tells me that he had one in his vivarium in company with a saw-scaled viper (*Echis carinata*). The *Echis* one day was observed to be particularly lively, and it is possible may have molested the *Eryx*. At any rate the *Eryx* wound itself round the viper's neck and constricted with such force that the viper succumbed next day to the injuries received.

Breeding.—Practically nothing is known of the breeding. We

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

do not even know whether it is oviparous, or viviparous though it is probably the former. The season when mating occurs, and the time of year when the young appear are similarly unknown. The smallest specimen I know of is the one mentioned by Russell, 9⅓ inches long, probably a hatchling, which came from Bengal, but no date of capture is given.

Observations on the breeding habits are badly wanted, and with so common a snake, and one that thrives so well in captivity these observations should not be difficult to collect.

Sloughing.—In the Madras Museum some years ago attention was directed to this function with the following results:—One desquamated on 1-4-95, 3-5-95, 22-10-95 and 21-2-96. Another (if not the same) on 24-4-96, 28-6-96, 18-9-96 and 14-1-97. A third (if not the same specimen) on 2-8-97, 10-11-97 and 17-3-98. It thus appears to slough about four times annually at intervals varying from one to five months, and at no special season of the year.

Legends.—Russell tells us that in his day the natives in Southern India declared that the bite of this snake produced leprosy. The belief is still as firm there now, even a lick from its tongue being, natives declare, sufficient to cause that terrible malady. The Rev. C. Liegh, S.J., and Dr. Henderson have both written to me to this effect. In the Punjab they say that if it once bites any one, the bitten subject will be again bitten on each succeeding anniversary of the accident by the same snake, which however is quite invisible to everyone, but its victim.

The belief that it has two heads, one at each end seems to be universal. The natives in Southern India, Lower Bengal, and the Punjab all say the same, and their names for it are founded on this assumption. In Lower Bengal and in the Punjab they say that the reptile uses each head alternately for six months. The obstinacy of the native in crediting fabulous stories of this description is most extraordinary. Even if one takes the trouble to demonstrate the true character of the tail, and a native has been prevailed upon to look attentively, he prefers to allow his imagination to override his common sense, and to discredit the evidence of his own eyes.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

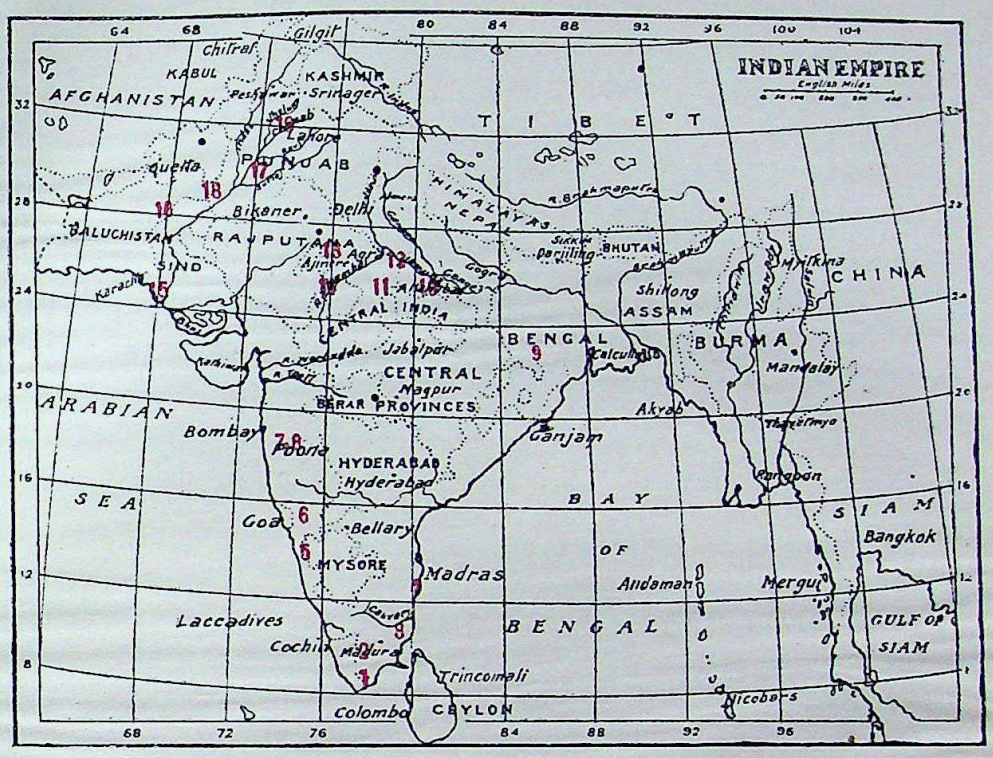
Distribution.—Its distribution is probably the same as *conicus*, but records of the snake are very meagre. I have lately seen specimens from Baluchistan, but this is the furthest record I am aware of in the North-West. I am doubtful if it occurs in the Ganges Valley, and there appear to be no records from Central India, the Central Provinces or Upper Bengal, but with these exceptions it is known to occur throughout Peninsula India. It has not been recorded from Ceylon. It is an inhabitant of the Plains but wanders into the lower slopes of hilly regions. In the Western Hills it has been met with at Khandalla and Belgaum (about 2,000 feet), but I do not think it occurs in the Himalayas anywhere. The specimen in the British Museum collected by Von Schlagentweit said to have come from Sikkim (9,800 feet) is discredited by Mr. Boulenger, and his doubts must be certainly shared by all Indian herpetologists.

It is possible the specimen may have been in the possession of a juggler, and I know from personal experience how untruthful these people are when questioned. In Fyzabad I interrogated a juggler about a typical monocellate cobra he had, and which he assured me he had got in the Cantonment Gardens a day or two before, but he finally confessed that the statement was untrue, and he had captured it in Bengal near Calcutta somewhere. The precise localities from which it has been recorded are shown in the accompanying map.

Lepidosis.—*Rostral*—A very large shield, with an angular transverse ridge. Touches six shields, the anterior and posterior nasals and the 1st labial. *Internasals*—Absent. *Nasals*—Two, an anterior, and a posterior, with the nostril between; the anterior meeting behind the rostral in contact with 1st and 2nd labials. Eye surrounded by small scales, one or two rows intervening between it, and the labials. *Supralabials*—10 to 13, the anterior largest, and higher than long. *Infralabials*—3 or 6, behind which a series of marginal scales borders the lip; the 1st do not meet behind the mental. A mental groove bordered by small scales. *Costals*—54 to 65 in midbody as long or rather longer than broad, except the last 3 rows which progressively increase in breadth, and are much broader than long, the last being about

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



DISTRIBUTION OF *ERYX JOHNI.*

I. M. implies Indian Museum, B. M., British Museum, Bo. M., Bombay Society's Collection, F. W., the Writer.

1. Ramanad (I. M). 2. Trichinopoly (F. W.). 3. Tranquebar (Russell). 4. Madras (B. M.). 5. Malabar (Dumeril et Bibron). 6. Belgaum (B. M.). 7. Khandalla (Dreckman). 8. Poona (Bo. M.). 9. Bengal (Russell). 10. Allahabad (D'Abreu *in epistola*). 11. Dholpur (F. W.). 12. Agra (I. M.). 13. Jeypore (I. M.). 14. Ajmere (I. M.). 15. Karachi (I. M. & B. M.). 16. Hanna and Duki, Baluchistan (F. W.) 17. Multan (Bo. M.). 18. Rajanpur (I. M.). 19. Pind Dadun Khan (I. M.).*

* We trust our readers will take every opportunity to send specimens of *E. johni* and *conicus* to our Society's Collection, especially from the Punjab and Bengal, to throw more light on their exact limits.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

½ or little less than ½ the breadth of the ventrals. Keels present in the median dorsal rows, but very obtuse. *Ventrals*—Narrow, 189 to 210. *Anal*—Trifid, the median part largest. *Subcaudals*—25 to 36, mostly entire, but many often divided.

Dentition.—In my single skull which is from a Trichinopoly specimen the teeth are as follows:—*Maxillary*—11, gradually decreasing from before backwards. *Palatine*—4, decreasing from before backwards; about as large as the maxillary. *Pterygoid*—3, subequal, well developed and about as large as the posterior maxillary. *Mandibular*—13, decreasing from before backwards.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART V.

(Continued from page 929 of Volume XX.)

Sub-Order—OTIDES.

The Bustards form a sub-order of birds connected with, yet distinctly separated from, many others. In general superficial appearance they are, perhaps, most like the Gallinaceous birds, more especially in regard to their heads and wings. They are, however, more closely allied in anatomy and other ways to many other families, such as the Rails, Cranes, Plovers and, in the New World, the Tinamus.

They are schizognathous and holorhinal, the cervical vertebræ are either 16 or 17 in number and the sternum has two small notches on each side of the posterior border. There is no hallux or hind toe and the two deep flexor tendons unite and again divide into three.

They possess ambiens, accessory femoro-caudal, semi-tendinosus and accessory semi-tendinosus muscles, but the femoro-caudal is absent.

There is no oil-gland and the cæca are long.

The contour feathers possess an after-shaft and there is no lateral bare tract on the side of the neck.

Family—OTIDIDÆ.

The Family of Bustards, which is the only one in the Sub-order Otides, contains birds ranging in size from that of a large partridge to birds weighing as much, or more than, 40 lbs. They are generally of sturdy build with comparatively long necks and legs, the latter very strong and furnished with three toes only. These, the toes, are remarkably broad and fleshy, but at the same time short in comparison to the size of the bird they have to support. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

claws are short and blunt. The tarsi are reticulated with small, often unequal, scales and the toes are scutellated above.

In some species the males possess a small gular pouch which is connected with an opening under the tongue.

The tail feathers vary from 16 to 20 in number in different species, and the primaries number 11, the first being of considerable length.

The young are hatched covered with down and can run about almost immediately after leaving the egg.

Otididæ, of some one or more species, inhabit the three continents of the Old World—Europe, Asia and Africa—and one species—a very close relation of our Great Indian Bustard—is also found in Australia. Some genera and species, such as *Otis tarda*, extend over a vast extent of country whilst others again, for example *Sypheotis*, are very local in their distribution.

Within Indian limits we find six species, which are generally divided into four genera, but many systematists, the late Dr. R. Bowdler-Sharpe amongst others, divide two of our genera, *Otis* and *Sypheotis*, yet again. For the purpose of these articles I, however, retain Blanford's classification and omit Sharpe's genera, *Tetrax* and *Houbaropsis*.

KEY TO GENERA.

A.—No ruff. Sexes differing in size or in breeding plumage.

(*a*) Top of head black.

a^1 Wing over 20″ ... ... *Eupodotis.*

b^1 Wing under 16″ ... ... *Sypheotis.*

(*b*) Top of head not black.

a^2 Tarsus more than $\frac{1}{3}$ length of wing. *Sypheotis.*

b^2 Tarsus $\frac{1}{4}$ length of wing ... ... *Otis.*

B.—A ruff on either side of neck. Sexes alike. *Houbara.*

Genus—OTIS.

This genus is now generally divided into two, *Otis* confined to *Otis tarda* and its first cousin *Otis dybowskii* and *Tetrax* which contains only the Little Bustard, *Tetrax tetrax*. There is but little

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

outward difference, however, in these two genera beyond size, and I retain Blyth's classification for these Bustards and place both our birds in the one genus.

The genus *Otis* may be distinguished from the other genera of this family by the fact that the crown of the head is never black, and only very short-crested and the short, stout tarsus is only equal to $\frac{1}{4}$ of the length of the wing.

The Great Bustard, *Otis tarda*, has no seasonal change of plumage, but the male of the Small Bustard, *Otis tetrax*, has one. Again, whereas the male of *Otis tarda* is much bigger than the female, the female of *Otis tetrax* is certainly as large as the male and sometimes somewhat larger.

KEY TO SPECIES.

Wing over 15″, generally between 18″ and 25″... *tarda*.
Wing under 15″, generally between 9″ and 11″... *tetrax*.

OTIS TARDA.

The Great Bustard.

Otis tarda.—Linn. Syst. Nat. 1, p. 264; Hume, *Ibis*, 1871, p. 404; *id.*, Str. Feath. vii, p. 434; Hume and Marsh. Game Birds I, p. 1, pl.; Hume, Cat. No. 836 bis; Sharpe, Cat. B.M. xxiii, p. 284; *id* Hand. List. B. i, p. 173; Finn, "Indian Waders" p. 116. Oates, Game-Birds, i, p. 394; *id*, Eggs of B.M., ii, p. 84; Willoughby Verner, "My Life among the Wild Birds in Spain" pp. 131 *et seq*; Chapman and Buck, "Unexplored Spain" p. 253; Fooks, *The Field* Febr. 11, 1911.

Vernacular Name.—Deo-dagh (Chitrali.)

Description—Adult Male.—General colour above sandy rufous, broadly banded across with black, the bands very strongly marked on the upper back and scapulars, less so on lower back and rump; upper tail-coverts and tail feathers light bay or vinous-chestnut, barred across with black, some of the bars broken up; the tail feathers more or less distinctly tipped with white, the outer feathers white at the base, the three outermost almost entirely white, with a broad subterminal band of black; lesser wing-coverts like the back, with black bars, less closely arranged than on the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

back; remainder of wing-coverts, bastard-wing, and primary coverts white, powdered with grey towards the end of the feathers; quills brown with white bases, the primaries whity-brown with white shafts, the outer web and the tips blackish; the outer secondaries blackish, white at the base, the white increasing in extent towards the inner secondaries, which have a gradually decreasing extent of black tip till the last feathers are quite white, the innermost secondaries being sandy rufous barred with black like the back; crown of head light grey, becoming tinged with rufous on the hind neck, which has numerous narrow black transverse bars, sides or face, ear-coverts, cheeks and entire throat light grey, with elongated bristle-like feathers on each side of the chin; lower throat orange-chestnut, forming a band across the fore-neck, which is washed with light grey, the sides of the neck with numerous small bars of black; sides of upper breast sandy rufous barred with black; remainder of undersurface of body pure white.

"Bill leaden-grey, horn black at the tip; feet earthy brown, nails horny black; iris dark-brown; eyelid with white feathers." (J. F. Naumann).

"Total length about 42 inches, culmen 2·1, wing 23·5, tail 10, tarsus 6." (Sharpe).

Adult female.—The female differs from the male chiefly in being considerably smaller and in having no whiskers. The chestnut band on the lower throat of the male exists in the female only as patches at the sides under the shoulders of the wing.

Wing 18·25″ to 20″; culmen 1·9″ to 2·1″; bill from gape 2·75″; tarsus 4·5″ to 5·25″; mid toe 2·25″; tail about 8″.

Young.—The crown of the head like the back, which is similar to that of the females but paler and less boldly marked with black; lower throat and foreneck more or less washed with sandy buff; the white of the wings is much marked with black, the bastard wing is barred with rufous and brown and there is a certain amount of rufous on the greater wing coverts.

Nestling.—Covered with light down, mottled with black.

Colonel Willoughby Verner in his most interesting book "My Life among the Wild Birds in Spain" makes the following remarks concerning the weights of Bustards:—"The weight of a Bustard

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

is a subject of which very varied accounts have been written. Apparently the unfortunate stragglers which have from time to time visited England and have been promptly slain, must have been very young birds. Yarrele records males of only 16 lbs. and females of 9 lbs. to 10 lbs., whereas the males in Spain commonly weigh between 20 lbs. to 30 lbs. and the females 12 lbs. to 18 lbs. Professor Newton mentions 22 lbs. to 32 lbs. as the average weight of European Bustards. The remarkable variations of weight in birds shot out of the same flocks and in the same localities lead me to believe that Bustards take very much longer to reach maturity than is popularly imagined. Again, they seem to vary enormously in weight according to the season of the year. Out of a number of Bustards I have weighed and examined, those killed in the winter months have averaged only about two-thirds the weight of those killed in March and April. The smallest Great Bustard I ever saw killed was a young female in the month of February, and which weighed only 12 lbs. This bird must have been at least 9 months old."

"Six old male birds shot by a party of three guns, of which I was one, in the month of April averaged over 34 lbs. each, the heaviest being 37 lbs.; no doubt the contents of the crops accounted for some of this great weight."

In "Unexplored Spain" Messrs. Chapman and Buck give much the same weights. They say: "In weight, cock Bustards vary from 20 to 22 lbs. in Autumn, up to 28 to 30 lbs. in April. The biggest old males in spring reach 33 and 34 lbs., and one we presented to the National Collection at South Kensington weighed 37 lbs."

"Hen-Bustards seldom exceed 15 lbs. at any season."

Sharpe gives the range of this magnificent bird as "Southern Europe and Northern Africa, extending to Central Asia and N.-W. India" and this range now includes Persia and Afghanistan. In the latter country it was obtained by the Afghan Delimitation Commission and in the former it has now been several times taken and I have eggs also thence.

To the east of this recorded range its place is taken by a very closely allied species, *Otis dybowskii*. This species, or more

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

properly speaking sub-species, has no rufous breast-band in the male and in that sex there is also a band of white or greyish white formed by the median wing-coverts. The female differs from the female of *Otis tarda*, if at all, in having the head a somewhat darker grey.

In India the Great Bustard has been obtained on only four occasions; on one of these, two females having been shot, on the other three occasions single females.

It was first obtained by Hume's collectors in 1870 and Hume thus records the event:—"Once, and once only as yet, has the Great Bustard of Europe been obtained within the limits of the British Empire in the East.

"On the 23rd of December 1870, a couple of my collectors, who were working at Mardan, under the Direction of Dr. J. A. Johnson, then of the Guides, came across a party of Bustard in some fields of mustard and giant millet, belonging to Hashtnagar and just north of the Kabul river. The birds were very shy, but my old jamadar succeeded, by driving a buffalo in front of him, in getting within shot and knocking over a female.

"This Hashtnagar is within a few miles of the very most north-westerly point of British India proper, and is in lat. 34 N. and long. 7·45′ E.

"This party of Bustard did not leave the neighbourhood for some weeks, but they were so wary that, despite all the efforts of many sportsmen, Native and European, no second specimen could be obtained; and notwithstanding repeated subsequent enquiries from officers stationed at Mardan, Michni and Shabkadar, in the midst of which Hashtnagar lies, I have never been able to learn that the Great Bustard has again revisited the locality."

After this, its next record is that by Col. Fooks, I.M.S., in the columns of *The Field* of the 11th February 1911, to which article my attention was drawn by Capt. A. H. Mosse. Col. Fooks' interesting note is as follows:—

"*Great Bustard shot in India.*—The Great Bustard is a very rare visitor to India, only one specimen having been shot in December 1870. Now, after forty years, two others were shot on January 8, by a duffadar of the 15th Lancers near the place where

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the first was killed. It was very cold over the north of India about Christmas, the thermometer falling to within half a degree of the record, which accounts for their presence here, and also for some Mute and Bewick's swans which have lately been seen on the Kabul river near Risalpur. In north China I once saw a large number of the European and the Great Indian Bustards on the same ground. It was interesting to note the difference between them; the latter were always scattered when feeding, and rose and flew independently like houbara, the lesser bustard, but the former did not separate so much when on the ground, and rose and flew together more like geese, although, of course, not in V formation. We do a great deal of hawking round here, especially Houbara, and it is the greatest ambition to kill one of the great European bustards with a saker falcon, but up to now no flight has been obtained of this fine species."

To this record Col. Fooks adds *in epistola*:—"The Great European Bustards were first seen here about the 20th December 1910, and migrated northwards again about the first week in February. I went after them several times to try and get a complete skin for the Bombay Natural History Museum, but was usually unable to find them when I had a gun, although I saw them several times when hawking Houbara. We flew a Goshawk at a flock (I don't know the right term) of eleven of them which we saw one day, but as the Great European Bustard keep together when on the wing, and do not separate like the Great Indian Bustard or Houbara, I rather fancy the hawk was afraid to come to close quarters, although we had a flight of about 3 miles and nearly lost the hawk. A duffadar of this regiment shot 2 females on the 6th January, they were both females and weighed 9½ lbs. each. It is interesting to note that these were killed in the same neighbourhood as the only previously reported one was, 40 years ago. I should think that probably about 25 of these birds were seen in this district, all told. I was able to recognize them before any were shot by their mode of flight, as they always keep more or less together on the ground and rise and fly together."

The fourth specimen which has been shot within Indian limits was killed by Capt. H. M. Symonds at Jacobabad, Sind, on the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

12th January 1911. As already stated this bird is a female and apparently not full grown. It is said to have weighed 5 lbs. when cleaned which would have given a weight of about 8 lbs. to the whole bird.

Finally the skin of another young female has been secured by Capt. Lyall, Chitral, and sent to the Bombay Society's Museum. This bird was shot by Lieutenant Stirling on the 30th March 1911, and Capt. Lyall in forwarding the specimen says *in epistola*:—"As far as I know the Bustard has not been recorded in Chitral, but I found that the Chitralis had got a name for the bird, 'Deo dagh,' though it is said to be a rare one."

It is interesting to note that all our records are of very young birds; a corroboration of the theory that young birds travel and migrate further than old ones.

In its general habits the Great Bustard closely resembles our Great Indian Bustard, but the few occasions on which it has been seen in India have not given much opportunity for observation, and it is on European authors, therefore, that we must rely for information.

Dresser, in "European Birds" gives the following interesting account of the habits of the Great Bustard:—"The Great Bustard frequents open, flat ground, preferring grassy plains or cultivated land, but avoiding localities near human habitations, and places where there are trees and bushes and where it cannot command an uninterrupted view over a large tract of country. It is peculiarly wary and shy; and it is almost impossible to approach it within gun shot range. Hilly country, and especially mountains, it avoids altogether, and is never met with in the woodlands and forests. It specially frequents cultivated fields, and is often found in those where rapeseed, wheat and rye have been sown. It passes the night in the open fields, choosing places where it cannot be approached without taking alarm, and is so watchful that it is impossible to surprise it when asleep. It leaves its night-quarters at the first break of dawn, and during the hot summer days will often take a siesta during the hottest part of the day, but it is then equally wary and difficult of approach. It flies with more ease than one would imagine, considering the size and weight of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bird and has no difficulty in taking wing, at once springing up into the air without first taking a step or two, and appears to prefer taking safety in flight rather than by making use of its legs. When it flies it stretches out its neck and legs and is thus easily distinguishable . . . . . Early in Spring, according to the mildness of the season, they commence to prepare for the cares of nidification; and the flocks then by degrees break up. The males fight desperately for the possession of the females, and may at that season of the year be seen strutting about, acting not unlike a Turkeycock."

As regards its flight all authors do not agree with Dresser, and some have remarked that this Bustard has to run a step or two before it can raise itself on the wing. Probably a good deal depends on the breeze, as a headwind would help the bird to get the use of his wings at once. Also, a bird suddenly startled, would use an extra effort and start into flight from where it stood, whereas a bird rising under ordinary circumstances might take matters more leisurely and run a pace or two before exerting itself to take to flight.

Col. Verner says that "The flight of the Great Bustard is extraordinarily quick and without effort. Before they take wing they simply walk for a few paces—no attempt at a run—and, opening their white wings, flap away in what appear to be a most leisurely manner. Save when there is a strong wind, or when coming off higher ground, they rarely fly more than thirty yards above the grounds, and hence, when they take the right direction, afford good driving shots. Nothing, however, is more deceptive than the pace they fly at, for owing to the steady beats of their immense pinions, some 8 ft. across, they seem to the eye to be moving slowly; but they are not.

"To appreciate the extraordinary speed they travel at it is necessary to have a bird pass close over one. More than once when lying absolutely prone on my face amid a few dead thistles . . . . . a Great Bustard has passed only a few yards over my lair, at times coming from behind or from some unexpected quarter whilst all one's energies were concentrated in the direction whence the driven birds were expected. On such occasions before

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

one can alter one's position and rise to shoot, it has passed out of shot!"

Messrs. Chapman and Buck's description agrees well with that of Col. Verner—"Two quick steps and a spring and the broad wings of every bird in the pack flap in slowly rising motion." Later on in the book (p. 252) they add "Tardy strokes deceive the eye, and the great bulk of the Bustard accentuates the deception —it seems impossible to miss them, a fatal error."

"Yet geese with their 40 strokes fly past, ducks at 120, and the bustard's apparently leisured movement carries him in full career as fast as whirring grouse with 200 revolutions to the minute. To kill bustard treat them on the same basis as the smaller game that appears faster but is not."

In former times the Bustard was considered a great delicacy for the table, as, indeed, were many other birds which it would take a very hungry man to tackle now-a-days. As also with many other birds, recent diet has much to do with their flavour, and whilst often its flesh may be found quite palatable, at other times it may be almost uneatable. Oates says:—"The Great Bustard has a peculiar and very disagreeable smell when alive, and its flesh is not now held in much esteem. Dr. E. T. Aitchinson informs us that when he was on the Afghan Delimitation Commission, a flock of these Bustards was met with, and Lieut. Rawlins succeeded in shooting one, but the stench of the bird was so great he almost thought of leaving it; it was so dark that he scarcely knew what it was that he had got, and the scent was almost enough to put off anyone from even a new acquisition. Notwithstanding this however, we are told that the flesh was eaten next day and found excellent."

Finn, in his "Indian Waders" also comments on this curious smell of the Bustard, and suggests that, it may be this which accounts for the strange antipathy which is alleged to exist between horses and Bustards. He quotes Pallas as saying in his "Zoographia Russo-Asiatica" that horses will trample on sitting hens should they get the chance, and he adds that Bustards have got into trouble in England by attacking horses.

It is said that Bustards have been captured by being run down

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on horse-back and this may be true when they are found in places where relays of horses and horsemen can take up the pursuit, otherwise it seems incredible that birds of such power of wing should be thus tired out and caught. They can certainly fly faster than any horse can gallop across country, unless for a very short distance, and if not at once put up by a fresh horse and rider and forced to fly again, would have ample time to recover before its exhausted pursuer could come to close quarters.

During the non-breeding season the Bustard is generally found in flocks (or droves, as flocks of these birds are usually termed). These droves may number anything from half a dozen to twenty birds, but, according to some authors, they are often seen together in much larger numbers than this, and Hume speaks of parties of 50 Bustards being seen together; whilst Colonel Willoughby Verner speaks to himself having seen 74 birds together in Andalucia; and Col. Irby records that "Bustards are usually found in troops varying from half a dozen birds to as many as 50 or 60 and in September we have seen 200 together." Very often these droves may break up and scatter over a large area of country when feeding, but when disturbed, leaving the ground for some other, they again unite and fly off together.

Bustards are very omnivorous, but their food undoubtedly consists mainly of grasshoppers and other insects, in addition to which they eat all sorts of grain and a good deal of green vegetable matter. When hungry or at all hard-pressed for food they will eat worms, small lizards, snakes, small mammals, such as shrews, mice, etc., and also the eggs of such other birds as deposit them on the ground. It has, like others of this family, a quaint habit of picking up and toying with any small bright object it may come across and also of swallowing the same, either by accident or design. In the same way small pebbles have often been taken from the internal arrangements of Bustards, but these are probably only swallowed as an aid to digestion. The specimen shot by Hume's collectors was found to have been feeding entirely on green mustard leaves.

The Bustard is believed by many writers never to drink and probably does so very seldom, but Finn has observed this bird

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

drinking when in confinement in the Zoological Gardens in London, and its not drinking may be a habit from which it departs where water is plentiful. According to Messrs. Chapman and Buck the fact that it does drink often leads to its destruction. They write :—" There is, however, one period of the year when the great bustard falls an easy prey to the clumsiest of gunners."

" During the long Andalucian summer a torrid sun has shrunk up every brook and stream that crosses the cultivated lands; the chinky, cracked mud, which in winter formed the bed of shallow lakes and lagoons, now yields no drop of moisture for birds or beasts. The larger rivers still carry their waters from sierra to sea, but an adaptive genius is required to utilise these for purposes of irrigation. All water required for the cattle is drawn up from wells; the old world lever with its bucket at one end and its counterpoise at the other has to provide for the needs of all. These wells are distributed all over the plains. As the herdsmen put the primitive contrivances into operation and swinging up bucketful after bucketful of cool water, the cattle crowd around, impatient to receive it as it rushes down the stone troughing. The thirsty animals drink their fill, splashing and wasting as much as they consume, so that a puddle is always formed about these *bebideros*. The moisture only extends a few yards, gradually diminishing, till the trickling streamlet is lost in the famishing soil.

" These moist places are a fatal trap to the bustard. Before dawn one of the farm-people will conceal himself so as to command at a short range all points of the miniature swamp. A slight hollow is dug for the purpose, having clods arranged around, between which the gun can be levelled with murderous accuracy. As day begins to dawn, the Bustard will take a flight in the direction of the well, alighting at a point some few hundred yards distant. They satisfy themselves that no enemy is about, and then, with cautious, stately step, make for their morning draught. One big bird steps on ahead of the rest; and as he cautiously draws near, he stops now and again to assure himself that all is right and that his companions are coming too—these are not in a compact body, but following at intervals of a few yards. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

leader has reached the spot where he drunk yesterday; now he finds he must go a little nearer to the well, as the streamlet has been diverted; another bird follows close; both lower their heads to drink; the gunner has them in line—at twenty paces there is no escape; the trigger is pressed, and two magnificent bustards are done to death. Should the man be provided with a second barrel (which is not usual), a third victim may be added to his morning's spoils."

Messrs. Chapman and Buck also describe a second method which the Spanish cultivators and cattlemen employ in winter. This is shooting them at night with the assistance of a dark lantern, much in the same way as in India our cultivators in many parts of the country kill deer, or as poachers in Wales spear Salmon.

To cover their movements and to lull the suspicions of the Bustards, the cattlemen carry on their wrists a cattle bell or *cencerro*, to which the Bustards are accustomed and of which they have no fear.

Many hens and young birds are also killed by so-called sportsmen during the breeding season, when the hens sit close and the young are not sufficiently advanced to seek safety in flight.

The two legitimate means of obtaining this grand game-bird are by driving and—a less sporting method—by working them in a grain cart as one shoots Black-buck in India. The latter method requires no description, for it is well known to most sportsmen in India, but the driving of Bustard requires so much special care and so much local knowledge that I again indent on Messrs. Chapman and Buck for their most interesting account of such a drive :—

"The district having been selected, it is advisible to send out the night before a trustworthy scout who will sleep at the *cortijo* and be abroad with the dawn in order to locate precisely the various *bandadas*, or troops of bustard, in the neighbourhood. The shooting party (three or four guns for choice, but in no case to exceed six) follow in the morning—riding, as a rule, to the rendezvous."

"Arrived at the *cortijo*, the scout brings in his report, and at once guns and drivers, all mounted proceed towards the nearest of the marked *bandadas* . . . . The drivers should number

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

three—the centre two flush the birds, two flankers to gallop at top speed in any direction should the game diverge from the required course or attempt to break out latterally."

"Ten minutes' ride and we are within view of our first *bandada*, still a mile away. They may be feeding on some broad slope, resting on the crest of a ridge, or dawdling on a level plain; but wherever the game may be—whatever the strategic value of their position—at least the decision of our own tactics must be clinched at once. No long lingering with futile discussion, no hesitation, or continued spying with the glass is permissible. Such follies instil instant suspicion into the astute brains on yonder hill, and the honours of the first round pass to the enemy."

"For this reason it is imperative to appoint one leader vested with supreme authority, and whose directions all must obey instantly and implicitly."

"The thoughts revolving in the leader's mind during his brief survey follow these general lines: First which is (*a*) the favourite, and (*b*) the most favourable line of flight of those bustards when disturbed; secondly, where can guns best be placed athwart that line; thirdly, how can the guns reach these points unseen? A condition precedent to success is that the firing line shall be drawn around the bustards fairly close up, yet without their knowledge. Without a halt the party ride round till out of sight. At the furthest safe advance, the guns dismount and proceed to spread themselves out—so far as possible in a semicircle—around the focal point. At 80 yards, apart each lies pressed on the earth, utilizing such shelter (if any) as may exist on the naked decline—say skeleton thistles, a tuft of wild asparagus, or on rare occasions a natural bank or tiny rain scoop."

"Now we have placed our guns in line and within that short distance of the unsuspecting game that all but assures a certain shot. We cannot, let us confess, recall many moments in life of more tense excitement than those spent thus, lying prone on the gentle slope listening with every sense on stretch for the cries of the galloping beaters as in wild career they urge the huge birds towards a fatal course. Before us rises the curving ridge, its summit sharply defined against an azure sky—azure but empty.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Now the light air wafts to our ear the tumultuous pulsations of giant wings and five seconds later that erst empty ether is crowded with two score huge forms. What a scene—and what commotion as, realising the danger, each great bird with strong and laboured wing-stroke swerves aside. One enormous *barbon* directly overhead receives first attention; a second, full broadside, presents no more difficulty, and ere the double thuds behind have attested the result, we realize that a third, shying off from our neighbour, is also 'our meat'."

The Bustard breeds all over Central and Southern Europe, where there is suitable country obtainable, and in former days was often known to breed in England, especially in the South-Eastern countries. Its strongholds in Europe, however, are Spain and Central and Southern Russia. From Europe it extends to Northern Africa and through Asia Minor and Persia as far as the extreme N.-W. of India and into Afghanistan. The birds seen and recorded from Eastern Siberia and China are the nearly allied species, *dybowskii*, which is often not distinguishable from our bird.

During the courting season the male is said to display the most extravagant anticks. Finn says that when courting "the male combines the extravagances of the Pouter or Fantail pigeons besides turning much of his plumage the wrong way," to this combination he may be said to add many of the courting attitudes of the Turkey. Where there is a slight eminence, handy proceedings are usually commenced by the bird climbing up this and calling loudly until a female or females are attracted, when he descends and goes through a variety of strutting and bowing actions until he thinks he has won the heart of the coveted female. He also erects his feathers, spreads his tail and displays his wings in a trailling position and struts round his bride much as a Turkey does. These actions and the curious twisting of the feathers are most beautifully shown in a plate opposite p. 260 in "Unexplored Spain," and this plate also shows how the general appearance becomes white during the pre-nuptial contortions and displays.

The Bustard is polygamous, but it is rather unfair to the male

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to leave the matter thus; for there is no doubt that the female will accept the attentions of any male who can succeed in conquering her husband for the time being and adopting his harem. The males fight desparately during the breeding season, and are said by some observers often to seriously injure one another. This, however, hardly agrees with Col. Verner's amusing description of the fights. He writes (p. 137) "One of the most perplexing traits in the Bustard's character is that he by no means confines the period of these antics to the season of courtship. Long after the females have settled down to their eggs in the far distant corn-lands the males, congregated in big flocks, will continue to indulge in their frenzied movements, which, so far as I have ever been able to see, are purely games of "bluff" and "swagger" which never lead to more than a momentary encounter—a sort of collision and "fend off" with another bird, after which both turn about and continue their absurd movements independently. When one watches such an encounter, one can almost imagine one inverted old cock saying to another: 'You be off!' 'I won't' replies Number Two. 'What! *you won't?*' Thunders No. 1., rustling up to him with creaking primaries and a generally appalling appearance. 'No!' says No. 2, equally crackling all over and strutting around ferociously '*Then stay where you are*' remarks No. 1, wheeling about and adroitly evading the difficulties of the situation."

The nest, if such it can be called, is merely a depression in the soil either natural or scratched in loose sand or earth by the bird itself. As a rule, the site selected is in some field of grain or in scrub grass sufficiently high to conceal the sitting bird and its eggs; but sometimes it is in comparatively or quite open country, only screened from sun and enemies by a stunted bush or two or a small patch of withered grass. The hen is said to be a close sitter, once the eggs are advanced in incubation, but when newly laid she leaves them at the first signs of danger, and slinking through the cover, if there is any, takes to wing far from their vicinity.

As with other polygamous birds, the male takes no interest in the hatching of the eggs or bringing up of the chicks, and these duties are left entirely to the female.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The eggs are generally laid in May, the time merely varying according to the latitude. In its more Northern habitat no eggs will be found until well on into May, whilst many may be taken in June, on the other hand, in Northern Africa, South Russia and Asia Minor it is said sometimes to lay in the end of April, and eggs have been taken in North Africa as early as the first week of that month.

The normal clutch of eggs is generally said to be two and occasionally but one egg is incubated. On the other hand, three eggs are sometimes laid in a clutch, although this would seem to be rather rare and four and even five eggs have been taken from the same nest. There are two clutches in the British Museum, both in the Seebohm Collection, which contains three eggs, one taken at Halberstadt, Germany, on the 22nd May, and the other at Choousk-Keui, Asia Minor, on the 11th May.

Both Col. Verner and Col. Irby, however, consider 3 or 4 the normal clutch. The former says:—"It is well known to all interested in bird-life that when once a 'fact' regarding natural history has been duly recorded, it takes a long time to disprove it, successive authorities being content to quote from one another without seeking for further information. Among such is the generally accepted statement regarding the number of eggs laid by the Great Bustard which has been recorded as two from time immemorial, with the explanation that when four eggs are found in a nest 'no doubt two females have laid in it'. In consequence when I first saw a nest with four eggs I duly noted the fact and entered the usual stock explanation in my diary. By good chance my notes some years later were read by the late Lord Lilford, undoubtedly one of the best authorities on the birds of the Spanish Peninsular, who very kindly pencilled across the page: 'The Great Bustard often lays four and rarely five eggs. L.'"

"Some years later I met with a second nest with four eggs as recorded by Colonel Irby."

"After Col. Irby's book appeared, I on several occasions found Bustards' nests with three eggs, not four, sometimes considerably incubated but it was not until last year that after a long interval I chanced to be among the Bustards at the right time. In May,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1907, in one beanfield, I came across no fewer than four nests containing respectively four, three, three, and two eggs. The set of four were somewhat incubated, as were one of the sets of three, the remainder being quite fresh."

"My conclusion, based on many years' experience, is that Great Bustards commonly lay three or four eggs, but in some instances they only lay two, though in others even five eggs."

Normally the eggs of the Great European Bustard are broad eclipses in shape, rarely oval, and still more rarely with both ends somewhat pointed. Dresser, in "European Birds", gives the greatest and least dimensions of ten as 3·47″ by 2·18″ and 3·075″ by 2·075″ respectively. In his "Palæartic Birds" he gives the average as 3·22″ × 2·12″.

The 26 eggs in the British Museum collection vary between 2·7″ and 3·35″ in length and between 2·0″ and 2·4″ in breadth. I have no eggs as large as the largest of Dresser's in my collection, but I have a pair from South Russia which measure only 2·65″ × 1·98″ and 2·63″ × 1·99.″ These are unusually small, almost abnormal, though both were, I believe, fertile eggs.

The ground colour varies very much, it may be a dark-stone colour, grey stone, dull olive-grey, or olive-brown, olive-buff or even olive-brown with a tinge of yellow; nine eggs out of ten, however, will be found to be olive, either olive-brown or olive-grey, more often the former, though even this will vary considerably in depth and richness of tone. Dresser says that sometimes the ground colour may be an almost uniform dull bluish, but in the very large series I have examined lately I have seen none such. The marks consist of blotches, smudges and clouds of dull-brown of various shades and density, sometimes reddish and occasionally purplish. These are seldom very numerous and sometimes very scanty and are distributed fairly evenly over the whole surface of the egg, being but rarely any more thickly scattered over the larger end than elsewhere.

The secondary or underlying spots are of paler brown and grey, as a rule the latter colour predominating. These markings are often tinted with purple or pink and are generally less well defined than the superior markings. I have seen a few eggs which have,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in addition to the markings already described, a few streaks and lines of very deep rich brown, in one or two almost black.

The texture is rather coarse, but extremely close and hard, and most eggs carry a very fine gloss, though this varies and is sometimes practically absent.

OTIS TETRAX.

The Little Bustard.

Otis tetrax.—Linn., Syst. Nat., i, p. 264 (1766); Jerdon, B. of I., iii, p. 625; Blyth, *Ibis*, 1867, p. 163; Beavan, *ibid*, 1868, p. 388; Blanford, East Persia, ii, p. 287; Scully, Str. F., iv, p. 184; Hume, *ibid.* vii, p. 435; Hume and Marsh. Game-B. i, p. 3; Hume Cat. No. 836; *ibid*, Str. Feath., viii, p. 111; Biddulph, *Ibis* 1881, p. 84; Scully, *ibid*, p. 586; Swinh. *ibid*, 1882, p. 119; St. John, *ibid*, 1889, p. 175; Sharpe, Yark. Miss. Aves, p. 145; Blanford, Avi. B. I., iv, p. 193; Finn, "Indian Waders" p. 118; Ward, B. N. H. S. Journal xvii, p. 945; Mitchell, *ibid*, xx, p. 1154; Verner, "My life among the Wild Birds of Spain," p. 149 *et seq.* Chapman and Buck, "Unexplored Spain," p. 262 *et seq.*

Tetrax tetrax.—Sharpe, Cat. B. M., xxiii, p. 287, *ibid*, Hand List, i, 174; Oates, Eggs of B. M., ii, p. 85; *ibid*, Game-B, i, p. 409.

Vernacular names.—Chota tilur, Obara, Punjabi; Kum-tokosi, Turki; Charaz, Baluchi.

Adult Male in breeding plumage.—General colour above sandy buff, coarsely vermiculated with black, and also showing some black blotches in the centre of the feathers; rump a little grayer than the back, the feathers being freckled with whitish instead of sandy buff; upper tail coverts white or white mottled with a few blackish markings; wing coverts like the back, but somewhat more sparsely vermiculated with black; lesser and median coverts white at the ends, and more or less freckled with black; the external coverts, bastard wing and greater coverts pure white, the inner ones slightly freckled or spotted with blackish; primary-coverts blackish, narrowly tipped with white; quills white, mostly blackish towards the ends, the tips of these feathers being again white, so that the black mark becomes subterminal; the outer primaries blackish with white bases, the white gradually increasing towards

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the secondaries, which are almost entirely white with an occasional spot of black. Innermost secondaries like the back; tail-feathers coarsely freckled with black on a white ground and crossed with four distinct bars of blackish, which are very pronounced on the basal half of the tail, which is white without any blackish frecklings, the outer feathers broadly tipped with creamy white; crown of head, nape and hind neck brown, mottled with streaks and edgings of sandy buff, with a few blue-grey feathers intermixed; lores and sides of crown pale and sandy buff, streaked with dark brown; feathers above and round the eye uniform creamy buff; sides of face, ear-coverts, cheeks and throat light bluish grey, which is bordered by a broad band of black extending from the sides of the hind neck diagonally across the latter and uniting in a broad band which runs down the centre of the lower throat; around the hind neck and occupying the sides of the latter is a broad extent of black which unites on the upper foreneck; this is bordered above by a broad band of white which encircles the hind neck, separates the black on the sides of the neck, and descending on the latter to the lower throat, unites there in a point; across the lower foreneck a broad black band, which is separated from the lower throat by a band of white which traverses the foreneck also; remainder of undersurface pure white; sites of the upper breast sandy-coloured and mottled with black like the upper parts; underwing coverts, axillaries and quill-lining pure white.

Adult Female.—Whole upper surface rich buff or rufous buff, vermiculated with black and with black central lines here and there widening into blotches; on the hind neck the markings are very fine and the buff replaced by brown; the black markings on the crown form irregular bars; lesser wing coverts like the back but less profusely marked with black, median coverts the same but with still less black and with the buff becoming almost white at the tips, greater coverts white with dark brown or blackish shaft streaks and with a few scattered specks and spots of black which become regular subterminal bars on the innermost; primaries dark brown mottled with white at the tips and with white bases, concealed on the outermost but increasing in extent until the innermost are nearly all white, outer secondaries white, with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

specks and bars of black at wide intervals, inner secondaries like the back. Chin and upper throat dull buff or brownish white, the underneck the same streaked with black and buff sides of head like throat but streaked finely with black; lower throat and breast dull pale buff, the former streaked and the latter barred with black. The centre of the breast is generally nearly white, as is the lower breast, and the bars are wider apart. Under the wing the buff extends down the breast for some two or more inches; remainder of underparts, flanks and underwing coverts white; some of the feathers of the flanks with black shafts and here and there a black spot.

Male in Winter.—Resembles the female but the vermiculations are finer and the black markings less bold. The black crescentic marks on the lower breast are also less defined and regular.

Young.—"General distinguishable from the adult by the greater amount of barring on the chest, by the more profuse barring on the upper tail-coverts and the sandy frecklings of the primary coverts." (Sharpe).

In this species, unlike *Otis tarda*, there is little difference in size between the sexes, and whereas in that bird the male greatly exceeds the female, in this the male, though it averages heavier and a little bigger, is not apparently so. Hume says in regard to Indian birds, "I do not find the sexes differ materially, although the males unquestionably average rather larger and are perceptibly heavier."

"The following are dimensions, etc., recorded of Indian specimens:—Length 17 to 19 inches; expanse 33·5 to 36; wing 9·5 to 10·1; tail 4 to 5; tarsus 2·2 to 2·66; bill from gape 1·5 to 1·6; weight 1·5 to 2 lbs."

"The colours of the soft parts vary a good deal; the legs and feet are yellow, dusky yellow, greenish yellow, the feet often browner and dingier; the bill is blackish, greenish black, dusky horny or brown, generally paler on culmen, and bluish grey, greenish or yellowish at the base and the irides vary from light yellow to orange."

J. F. Naumann says the irides of the young are brownish yellow. Sharpe notes some curious measurements in the Catalogue, he

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

gives the culmen of the male as 1·5″ and that of the female 1·1″ but the wing of the male as averaging 9·4″ whilst that of the female is 9·7″.

Blanford thus defines the distribution of the Little Bustard "Southern Europe, Northern Africa and Central Asia, including Afghanistan and Yarkand. A few birds occur in Gilgit, and this species is a regular winter visitant to the extreme North-Western Punjab near Peshawar. A few stragglers are found occasionally east of the Indus and the species has been recorded from Gurdaspur and even from Saharanpur."

Hume, as usual, gives a good and detailed account of the habitat of *Otis tetrax*, both in reference to its whole range and its occurrences within Indian limits. He writes:—"The Butterfly Houbara, as Indian sportsmen in the North-West have not inappropriately designated the Little Bustard of Europe, is a regular and tolerably abundant winter visitant to the northern portions of the Trans-Indus Punjab.

"Cis-Indus, they can only be considered rare and occasional stragglers. In December 1878, Col. Macleod, R.A., shot a fine male of this species near Gurdaspur, and about the same time Mr. O. Greig shot a female at Balawala on the bank above the Ganges Kadar in the Saharanpur district; and, others must doubtless have occurred in the submontane tracts of the Punjab and North-Western Provinces; these are, I believe, the only instances on record of their being brought to bag."

"Out of India, the Little Bustard is common in suitable localities in Southern Europe and Northern Africa, adjoining the basin of the Mediterranean. It straggles to Northern Europe, even to the British Isles and Sweden. It occurs, and very numerously, in some places, in Syria, Asia Minor, the Caucasus, Northern Persia, Kabul and Northern Baluchistan, and throughout the tract of country lying between the Caspian and Western Yarkand, whence we have specimens from Yangihissar, Kashgar and other places in the plains between these and Sanju."

"It does not appear to go north across the Tian Shan, or eastwards into Mongolia or China; neither Radde, Prjevalski nor David include it in their lists."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A remarkable extension to this birds range is made by records of three birds obtained in Kashmir. The first of these refers to one obtained by Col. A. E. Ward near Hajan, Kashmir, in December 1906, and recorded in Vol. XVII of the Journal of the Bombay Natural History Society; the other two are recorded by Mr. F. J. Mitchell in Vol. XX of the same journal. Of these two latter one was shot by Major Brown during a duck drive on the Hooka Sar Jhil in 1910 and the second by Major Smith near the Woolar Lake in early 1911.

The Little Bustard is, of course, only a cold weather visitant to India, arriving early in October and leaving in March, occasionally staying as late as the first week or two in April. These dates are very rough but there is a curious absence of all records as to this bird's appearance and disappearance from Indian limits and an almost equal lack of accounts of its ever being shot or hawked.

One of the best general accounts of this bird's habits, &c., is that given by Seebohm and quoted by Oates on pp. 410-411 of "Game Birds." Seebohm writes as follows: "It is a partial migrant, arriving at its breeding grounds in flocks early in April, which are dispersed in May. It is so much less than the Great Bustard, that by the middle of May the grass and the flowers hide it completely from view. The females sit very close and are difficult to find, but the males betray themselves by their curious notes. As you drive slowly across the steppes, your attention is arrested by a distant cry, resembling the sound of the syllable spurrtz. By following with the wagon in the direction whence it proceeds for a hundred yards or more, you may generally put up the bird, frequently within shot, but it followed on foot there is little or no chance of securing it. The flight is quite different to that of the Great Bustard, more resembling that of the partridge than that of a heron. The wings are moved with great rapidity and the flight is very straight, though not very slow. The beats of the wing are so rapid that they make quite a loud whirring sound, and they shew more white when flying than the Great Bustard does. In many respects their flight resembles that of a butterfly or of a Snow-Bunting. We never saw two males together during the breeding season. The nest can only be found

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

by accident. We were driving rather quickly across the steppe, anxious to reach Kalarath before dark, when suddenly a female Little Bustard rose within ten feet of the wagon and was speedily dropped by our Jager, who was sitting gun in hand by the driver. We jumped out of the carriage, and in a quarter of a minute found the nest, containing four eggs. The hollow was deeper than that of the nest of the Great Bustard, and there was a distinct nest of dry grass and weeds, though very slight; it was about seven inches across and well concealed by tufts of a kind of lucerne."

Mr. M. M. L. Currie has sent me the following interesting note upon the occurrence of the Lesser Bustard in Ludhiana:—

"Bustard, *i. e.*, the Lesser Bustard or Obara, commonly called 'Tilur' in the Punjab was pretty common in the Dhera Ghazi Khan where I shot a certain number in the cold weather of 1908-09. They were most common in the dry tract at the foot of the Sulimans where they seemed to be especially fond of lying up on a kind of short coarse grass locally known as 'Ghamn.' Later in the year they haunt the fields sown with oil-seeds (faramira). I have also occasionally seen them down on the low lands near the Indus. The usual number seen together was three or four, but once or twice I have seen as many as a dozen together. The method of shooting most often employed is with camels. The sportsman dismounts and taking cover behind the camel continues to approach in circles till within range when he advances towards the spot where the bird is lying till he puts it up.

"The best bag I ever saw made in this manner was by a companion of mine who got six birds one day whilst I, not so fortunate, shot but one. It is said to be possible at times to walk them up in the oil-seeds, but I never did so with any success."

The Lesser Bustard is capable of straight, strong flight but often indulges in most curious vagaries when on the wing, rising to a great height and then twisting and twirling about in an indefinite kind of manner until it makes up its mind to go straight away. Some of my correspondents, however, who have met with this bird principally in grain and mustard fields, which offer good cover, describe it as lying very close, easy to walk up and easy to kill when once flushed. They describe the flight as being much like

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

that of a Partridge, though perhaps not so fast, and the bird is said to get up with a good deal of fluster of wings but once up to "get into its stride" and away at once. Others who have pursued this Bustard in more open plains describe the bird as shy and difficult to approach, rising far out of shot, but as being a poor, weak flier with a "flip, flap sidelong action" looking as if the bird could not make up its mind where to go.

Colonel Willoughby Verner in "My life among the Wild Birds of Spain" says "Their flight is effected by extremely rapid beats of the wing, noticeable even at great distances, owing to the flashing of the sunlight on the white portions. The noise produced by their quick motion is one which once heard can never be forgotten and can be likened to a quick sibilant sound of 'see-see-see-see' suggestive of that produced by the steam of a railway engine as it gathers way."

Messrs. Chapman and Buck, in commenting on the impossibility of driving the Little Bustard, write "You cannot diagnose beforehand his probable line of flight, for he has none, nor can you influence its subsequent direction. For the little bustard shuts off all negotiation at its initiation by springing vertically in air, soaring far above gunshot, and there indulging in fantastic ærial evolutions more in the style of a wigeon or other wildfowl than of a true game-bird as he is. Thus from that celestial altitude he spies out the country and all terrestial dangers, finally disappearing afar amidst the waste of atmospheric space. Frequently we have noticed the high-flying band, after, say, twenty minutes of such display of wing-power, descend directly to their original position at a safe interval after the drivers had passed forward thereof!"

Hume says that "At times, especially early and late, they are very wary, but at other times, chiefly, I think, when the sun is high and hot, they will lie as close as a Button Quail."

"They are often shot, bags of ten or a dozen couple having been reported; but it is chiefly as a quarry for falcons that they are esteemed, and in the neighbourhood of Mardan, hawking with the Saker or Chargh Falcon used to be a standing amusement.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"They are broad-breasted, compact, strong birds but withal easily killed though perhaps less so than the Florican."

The food of this Little Bustard is as varied as that of its big cousin, and though it lives principally on grain and green food it will devour anything in the insect line, and also slugs, snails, worms, and even small lizards, frogs, etc.

As an article for the table, opinions differ greatly, but whilst many consider it a delicacy, few condemn it altogether, and it certainly ranks as food not to be despised when once it has been shot. Messrs. Chapman and Buck declares "its flesh to be both delicate and delicious."

Dresser says that during the breeding season the male has a harsh cry why may be syllablized as *trec, trece,* and which can be heard from a great distance, and Col. Willoughby Verner says that when alarmed "it utters a loud gutteral rattling cry, somewhat similar to that of a grouse calling in early morning and even more like that given by the Bustard which we came across on the veldt between the Orange and Modder Rivers during the eventful days of November 1899."

The Lesser Bustard, like other birds of the family, is generally considered to be polygamous, and constant fighting between the males goes on throughout the breeding season for the females, who appear to be indifferent to what male takes them as long as they have a husband of some kind---Messrs. Chapman and Buck, however, disagreeing with the above write: "They are strictly monogamous, yet the males 'shew off' in the same fantastic way as great Bustard and Blackcock."

In the more Northern parts of its breeding range the eggs of the Lesser Bustard are laid late in May and early in June, but further South most will be found in the first fortnight of May and some in the end of April.

I have eggs from East Prussia, dated 26th June, and another clutch from Italy, dated 13th April.

Their breeding habits and nidification, if such it can be called, seem to closely resemble those of the Great Bustard. There is no nest, though sometimes the depression which contains the eggs may be more or less filled up with grass and weeds, and the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

constant lying on this may have formed it into a hollow cup. They select, or themselves make this depression, either in standing crops of grain or mustard or under shelter of a bush or patch of grass in an open plain and the hen sits very close when once incubation has begun.

Col. Verner thus describes the nests of the Little Bustard: "Few nests are more difficult to find than the Little Bustards', especially when they are amid the rank herbage on the fallow lands or the asphodel, when they are as well concealed as a Partridge's or Quail's. They are almost equally baffling when on the plains amongst the thousands of acres of waving reeds, 2 ft. or 3 ft. in height, which permit of the old bird running for an indefinite distance from the nest before taking wing. The same remark applies to those placed amongst the standing corn."

"The nest varies much in its size and construction, being at times a well compacted mass of dried grasses and herbage and in others little more than a chance collection of debris. Where a nest is well concealed, the female will sit very close and not betray its situation until almost trodden upon, whereas in more exposed situations she usually slips off and, crouching, runs some distance before taking wing."

"The nest here shewn was amidst a dense growth of coarse herbage, in which ox-eye daisies and dandelions predominated. The bird only left when I was within 2 ft. of her and in her scuffle and alarm drove a claw through one of the eggs. To get a photograph of this nest, we had to clear away much of the surrounding herbage. The nest was only a slight depression measuring 8 in. across and was lined with grasses and herbs pressed down around it."

"The day I found this nest with two eggs was dull and wet with heavy gusts of wind ... ... It was 18th May and, ... a few hours later on the very same day I came across a second nest about three miles from the first one. It would be hard to imagine a greater contrast than it presented, for it was on a bare and open hill-side, fallow ground with practically no cover on it save that afforded by some scattered patches of rank herbage. The nest was constructed in one of these patches and was quite open to view to any

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

passer by as can be seen from the picture. The cup of the nest was much deeper and better finished than the cup of the first one, being well lined with grasses. The adroitness of the Little Bustard is shewn by the fact that despite the open nature of the ground around this nest and of my keeping a sharp look out, we never saw her leave it and she took wing from a point just 23 yards (measured) from one side of it."

The number of eggs is generally four, but five eggs have been taken in the same clutch and three are often found whilst sometimes only two have been incubated.

Aksakoof, as quoted by Dresser, gives the number of eggs laid as from 8 to 12, but this, of course, is incorrect and is probably due to a mistake of some kind, as even clutches of five eggs are exceedingly rare.

Oates, in his British Museum Catalogue of eggs, thus describes the eggs of *Otis tetrax*: "The eggs of the Little Bustard are of a short pointed oval form, frequently elliptical and sometimes spheroidal. They are highly glossy. The ground is dark olive-green or olive-brown, and occasionally of a buff colour, and this is marked with streaks, clouds and blotches of very pale reddish brown or yellowish brown. The underlying markings are hardly separable from the ground colour. Many specimens are marked so faintly that they appear to be quite plain coloured; but when closely examined the markings can always be made out. The eggs measure from 1·92 to 2·23 in length and from 1·43 to 1·6 in breath."

In addition to the ground colours mentioned above I have one clutch which is a pale french grey with the markings very pronounced and dense, and two others again which might be termed olive-blue upon which the markings, though faint, contrast well and distinctly.

I have no eggs of the shape Oates describes as "short, pointed oval," mine all being spheroidal, or nearly so.

The texture is much finer and closer than that of the egg of the Great Bustard and is more consistently highly glossed.

My eggs average 1·92″ × 1·44″ and Dresser gives the average of his eggs as 1·95″ × 1·45″.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON BUTTERFLIES FROM THE NAGA HILLS.

BY

MAJOR H. C. TYTLER, 17TH INFANTRY.

(*With Plate A.*)

PART I.

The only account of butterflies from the Naga Hills, as far as I am aware, is that by Mr. H. J. Elwes, P. Z. S., 1891, p. 249, and 1892, p. 647; in these notes Mr. Elwes gives a list of the rarer and more interesting butterflies collected in the years 1889 and 1890 by Mr. Doherty in the Naga and Karen Hills and in Perak and also a few in the Assam valley.

In these notes I have included all the commoner butterflies most of which were probably taken by Mr. Doherty, but not mentioned by Mr. Elwes, and also a few not found by him; this is by no means a complete list and no doubt many other forms will turn up especially amongst the Lycænidæ and Hesperiidæ.

As far as possible I have given exact dates, localities and altitudes where the insects were captured and hope this will assist future collectors when working these interesting hills.

Since Mr. Doherty visited these hills the Assam Bengal Railway has been built and passes within a march of Nichuguard on the frontier, and so access to these hills is now very much easier.

The area collected over by myself and my collectors consists of—

(1) The low country at the foot of the hills between Nichuguard, about 700 ft. and Gaspani, 1,700 ft.; this consists almost entirely of fine forest and is excellent collecting ground.

(2) The country close to Kohima from 3,000 ft. to 5,000 ft., here the hillsides are extensively cultivated and what little forest there is is of recent growth, consequently good butterflies are not plentiful.

(3) The country above the cart road between Kohima and Maothana, on the Manipur frontier, from 5,000 ft. to 7,000 ft.; this is grand collecting ground, the hills are steep and covered with thick virgin forest.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

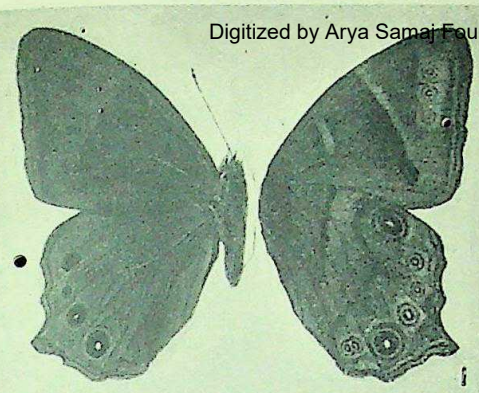
Digitized by Arya Samaj Foundation Chennai and eGangotri

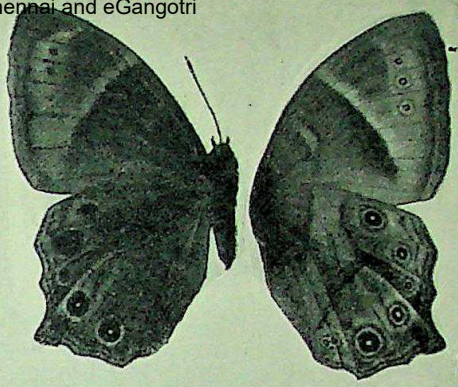
EXPLANATION OF PLATE A.

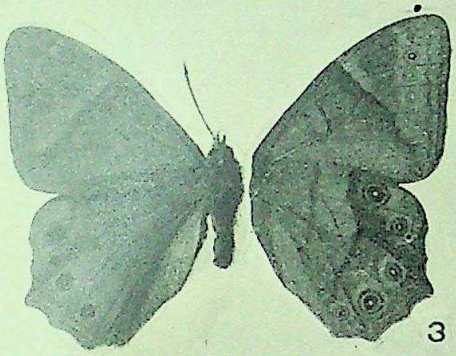
Fig. 1. Lethe brisandra, *de N.* ♂
" 2. " " " ♀
" 3. " dinarbas, *Hewitson* ♂
" 4. " " " ♀
" 5. Apatura florenciæ, *n. sp.* ♂ upperside.
" 6. " " " ♂ underside.
" 7. Cyllogenes janetæ, *de. N.* ♀

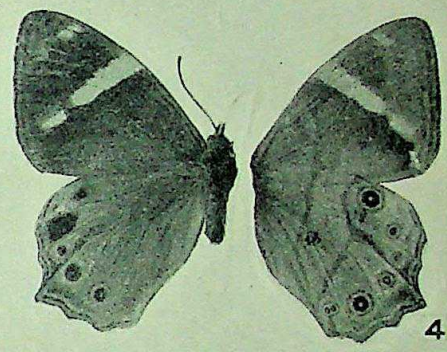
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

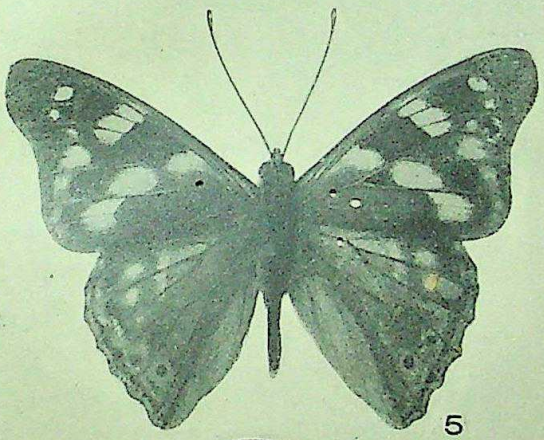
Digitized by Arya Samaj Foundation Chennai and eGangotri

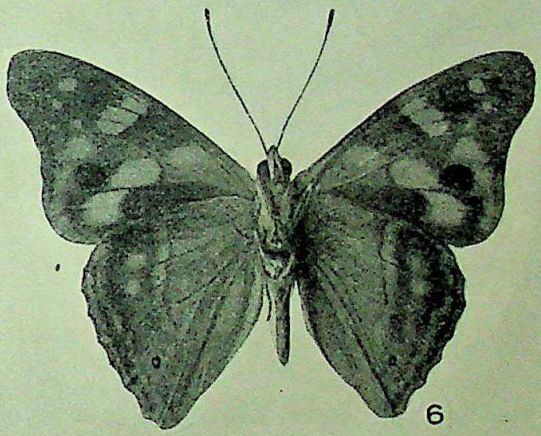

1

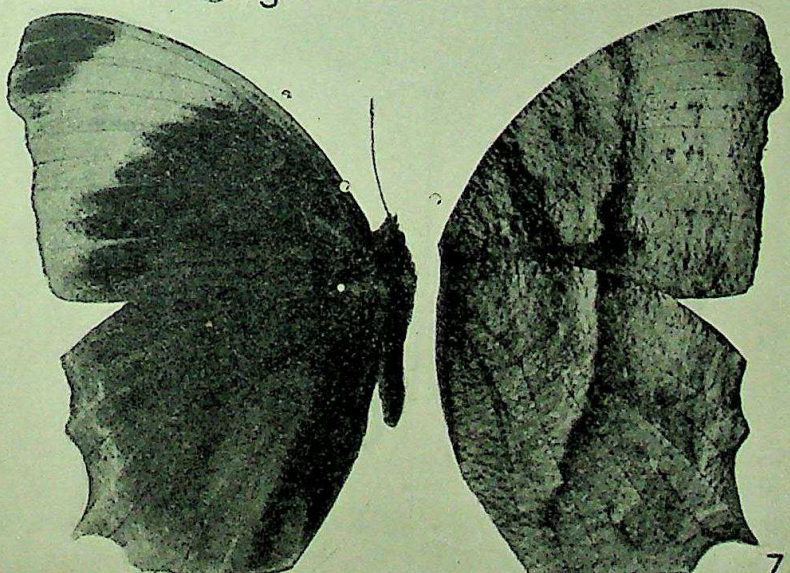

2


3


4


5


6


7

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(4) A few specimens were also obtained at Tamlu, at the Northern extremity of the Naga Hills, and given to me very kindly by Capt. Bliss.

FAMILY—NYMPHALIDÆ.

Sub-family—DANAINÆ.

1. **Danais plexippus,** *L.*—Occurs from the foot of the hills up to 5,000 ft. throughout the year.

2. **Danais chrysippus,** *L.*—A few specimens obtained at the foot of the hills in January and February.

3. **Danais tytia,** *Gray.*—Common near Kohima from August to October, one specimen obtained at the foot of the hills in February.

4. **Danais melanea,** *Cramer.*—Not common, a few specimens obtained near Kohima from August to October.

5. **Danais limniace,** *Cramer.*—Not very common, specimens were obtained at the foot of the hills in November and at Kohima from April to August.

6. **Danais septentrionis,** *Butler.*—Occurs commonly near Kohima from August to November, a few specimens were obtained at the foot of the hills in January and February.

7. **Danais melanoides,** *Moore.*—Common at the foot of the hills in February and March, and in the vicinity of Kohima from August to November.

8. **Euplœa hopei,** *Felder.*—Taken at the foot of the hills in March and October and near Kohima in April and May; in the latter month it is very common.

9. **Euplœa alcathoe,** *Godart.*—Not common, taken at the foot of the hills in February, April, July and November.

10. **Euplœa dione,** *Westwood.*—I have not obtained this butterfly but it is included in Mr. J. L. Sherwill's list of butterflies from the Naga Hills.

11. **Euplœa diocletiana,** *Fabr.*—A common butterfly, taken at low elevations throughout the year; females are rare.

12. **Euplœa klugii,** *Moore.*—Two specimens of the form *indigofera,* Moore, were obtained at the foot of the hills in May.

13. **Euplœa splendens,** *Butler.*—Not common, taken at low elevations in January, May, August and November and a single specimen at 5,000 ft. in November.

14. **Euplœa mulciber,** *Cramer.*—An extremely common butterfly throughout the year from the foot of the hills up to 6,000 ft.

Sub-family—SATYRINÆ.

15. **Mycalesis anaxias,** *Hewitson.*—Mr. Moore records this from the Naga Hills but I have not yet obtained it.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

16. **Mycalesis sanatana,** *Moore.*—A few wet season forms were obtained in May, October and November, and a single dry season form in May all at about 5,000 ft.

17. **Mycalesis charaka,** *Moore.*—Mr. Moore records this species from the Naga Hills.

18. **Mycalesis orseis,** *Hewitson.*—Recorded from the Naga Hills, but I have not met with it yet.

19. **Mycalesis mineus,** *Linn.*—Dry season forms were obtained at the foot of the hills in February and at Kohima commonly in October and November. Wet seasons forms occurred commonly at Kohima from August to October.

20. **Mycalesis visala,** *Moore.*—Two wet season forms were obtained at the foot of the hills in May and dry season forms at 2,000 ft. to 5,000 ft. in October and November.

21. **Mycalesis malsarida,** *Butler.*—Recorded from the Naga Hills but I have not met with it.

22. **Mycalesis malsara,** *Moore.*—A single dry season form was obtained at Phiphima, 4,000 ft. in February.

23. **Mycalesis lepcha,** *Moore.*—Dry season forms obtained at Gaspani, 2,000 ft. and at Kohima in March and April, and wet season forms at Kohima in August and October.

24. **Mycalesis nicotia,** *Hewitson.*—A single male, wet season form, was obtained at Kohima in August.

25. **Orsotriœna meda,** *Fabr.*—A single male taken at 5,000 ft.

26. **Lethe rohria,** *Fabr.*—Males common at Kohima and at the foot of the hills, April to November. Females rare.

27. **Lethe dinarbas,** *Hewitson.*—Pl. A, figs. 3 ♂, 4 ♀. Three males and three females taken at 7,000 ft. in September and a male at 6,000 ft. in October.

28. **Lethe brisanda,** *de N.*—Pl. A, figs. 1 ♂, 2 ♀. Three males and a female at 7,000 ft. and two males at 5,500 ft. taken in September and November. Bingham considers that *L. dinarbas* and *L. brisanda* to be merely races of *L. insana*. I however consider that *L. brisanda* is specifically distinct from *L. dinarbas*; the differences are clearly shewn in the figures on plate A. Both these forms, *i.e.*, *brisanda* and *dinarbas* fly together and I do not consider it possible for races of one species to do this.

The female taken is very different to the form figured in Moore's Lep. Ind. vol. 1, pl. 85, fig. 3 (*a*), but I have no doubt that I have identified it correctly as the characteristic markings are the same as in the male. In Moore's figure they certainly are not. Mr. Heron who kindly examined it for me is also of the opinion that it is the female of *L. brisanda*.

I give a description of it as it does not agree with de Nicéville's original description. *Upperside*, as in male but paler, the discal band on forewing

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

slightly broader and paler, beyond it three of the subapical ocelli of the underside shew through as black spots on a pale ground of the same colour as the discal band; above these spots inclined inwards are two pale brown diffuse spots in interspaces 6 and 7, the upper one minute. Hindwing with all the spots more conspicuous than in the male, those in interspaces 2 and 3 centred with white and distinctly encircled with yellowish brown, that in interspace 4 indistinctly encircled with the same colour and with no white pupil, those in interspaces 5 and 6 diffuse and blind and not encircled with an outer ring. The geminate spot in interspace 1 on the underside does not show through.

Underside as in male but paler: forewing, the discal band a little more curved, broader and paler; the area between it and the submarginal lines near the tornal angle yellowish brown; above which are four submarginal spots placed on a lilacine ground in interspaces 3, 4, 5 and 6; the lower three being black with white pupils, encircled with yellow and a narrow outer ring of darker colour; the upper spot lilacine with a dark outer ring. Hindwing as in male but lighter and the yellow rings round the occelli brighter.

The male and female can at once be distinguished from the same sexes of *Lethe dinarbas* as follows:—

(1) In *L. brisanda* the discal band is directed towards a point on the dorsum short of the tornal angle, whereas in *L. dinarbas* it is directed either towards the tornal angle, or to a point on the termen above it.

(2) The submarginal spots on the underside of the forewing in *L. brisanda* are four, in *L. dinarbas* three.

(3) The termen of the hindwing at vein 4 in *L. brisanda* is prolonged into a more distinct tooth than in *L. dinarbas* and gives the wing a different appearance.

In addition to the above differences the female of *L. brisanda* has the discal band narrow, pale-brown and curved, the female of *L. dinarbas* has it broad pure white and straight.

29. **Lethe confusa,** *Aurivillius.*—The wet season form is common at Kohima from July to October and the dry season form which appears to be undescribed was taken commonly from the foot of the hills up to 3,000 feet in February and April.

Description of the dry season form.—

Upperside: the same as in the wet season form except that on the hindwing the submarginal ocelli are more conspicuous and in some specimens distinctly ringed with yellow. *Underside*: differs from the wet season form as follows: the ground colour between the discal band and the apex of the forewing and also that on the anterior sides of the discal and discoidal bands rich chocolate brown, this colour filling the apex of the cell; the rest of the wing grey brown; the submarginal spots are partially

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ringed with whitish or ochreous lilacine and not with bright lilacine as in the wet season form; the areas between the upper two spots and the termen whitish and diffuse. Hindwing, the discoidal band anteriorly and the discal band posteriorly bordered with rich chocolate brown, the latter band more angled at its middle than in the wet season form; the areas between the discal and discoidal bands and the basal area extending to the tornus rich grey and the area between the submarginal spots and the submarginal line pale chocolate brown; the submarginal ocelli are more elongated than in the wet season form especially the apical one and the second from the bottom, all the ocelli except the upper one, which is blind, have the pupils more or less disintegrated. Each ocellus separately ringed with whitish lilacine and not enclosed in a common bright lilacine band as in the wet season form; the marginal and submarginal lines are quite distinct, of equal width and yellowish, the submarginal tinged with lilacine. In size the dry season form averages larger than the wet season form.

The dry season form may at once be recognised by the underside, the ground colour of which is dark chocolate and grey crossed by ochreous lilacine bands, in the wet season form the ground colour is uniformly dull brown with all the markings bright lilacine.

30. **Lethe verma,** *Kollar.*—Very common from 5,000 feet to 7,000 feet July to November.

31. **Lethe sidonis,** *Hewitson.*—Males very common, females rather rare at 5,000 to 7,000 feet. Wet season forms were obtained from July to October and large dry season forms in October, the latter do not agree with Moore's figure or description, they are of a much lighter brown than the wet season form on both surfaces; on the underside of the hindwing the 2nd, 3rd and 4th ocelli from the top only have blurred lilacine centres; two intermediate forms were also taken in September and October, both are of the same size as the wet season form but are as pale as the dry season form: in one form the ocelli of the hindwing resemble the rainy season form and in the other they resemble the dry season form.

32. **Lethe siderea,** *Marshall.*—A single male of this rare butterfly was obtained on 21st September near Kohima at 6,500 feet.

33. **Lethe scanda,** *Moore.*—Males not uncommon at 7,000 feet, I did not obtain the female.

34. **Lethe bhairava,** *Moore.*—A few specimens of both sexes were obtained at 7,000 feet in September; from October to December the males are fairly common, the females less so.

35. **Lethe guinihal,** *de N.*—A single male was obtained at Gaspani, 1,700 feet in July.

36. **Lethe latiaris,** *Hewitson.*—Occurs not uncommonly at 5,000—7,000 feet in September and October. Specimens of both sexes were captured in my garden at Kohima.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

37. **Lethe kansa,** *Moore.*—Occurs at the foot of the hills from May to August.

38. **Lethe vindhya,** *Felder.*—Three males of the wet season form taken at the foot of the hills in June and July.

39. **Lethe serbonis,** *Hewitson.*—Rather rare. A few males obtained between 6,000 and 7,000 feet in September.

40. **Lethe sinori,** *Hewitson.*—Three males obtained at 5,000 feet in July and October and a female in November.

41. **Lethe chandica,** *Moore.*—Not uncommon. Males obtained at the foot of the hills and at about 1,700 feet from February to November.

42. **Lethe mekara,** *Moore.*—A male taken in May at the foot of the hills and a female in November at Gaspani, 1,700 feet.

43. **Lethe goalpara,** *Moore.*—A pair obtained at 7,000 feet in September.

44. **Lethe sura,** *Doubleday?*—A very common butterfly from July to November. During September and October many males but only two females were taken; in November, however, females predominated, fourteen females being taken and only two males.

45. **Lethe khasiana,** *Moore.*—Two males taken by Mr. Doherty.

46. **Lethe pulahoides,** *Moore.*—Not uncommon at 5,000—6,000 feet in August and September.

47. **Lethe yamoides,** *Moore.*—Recorded from the Naga Hills, but I have not met with it.

48. **Zipœtis scylax,** *Hewitson.*—Recorded from the Naga Hills.

49. **Orinoma damaris,** *Gray.*—Not common, a few specimens taken at 5,000 feet in September and October.

. **Rhaphicera satricus,** *Doubleday.*—A single male obtained at 6,000 feet in September.

51. **Aulocera loha,** *Doherty.*—Two females of an *aulocera* thought by Mr. Elwes to belong to this species were obtained by Mr. Doherty at 8,000 feet in August near Mao on the Manipur frontier of the Naga Hills.

52. **Ypthima baldus,** *Fabr.*—Common. Dry season forms were obtained in February and Wet season forms in August at 4,600 feet.

53. **Ypthima affectata,** *Elwes and Edwards.*—Two males and a famale were taken at 2,000 feet in February.

54. **Ypthima austeni,** *Moore.*—Three males and one female obtained at Kohima, August to October.

55. **Ypthima methora,** *Hewitson.*—Recorded from the Naga Hills.

56. **Ypthima newara?,** *Moore.*—Not uncommon at Kohima from August to October. Specimens obtained are much smaller than the measurements given by Moore and Bingham, the smallest being 1·46 in expanse and the largest 1·64; the colour of the underside is not so yellow as in a specimen I have from Bhutan. It agrees more with the description of *Y. lycus*, de N., but the basal area does not appear to be darker than the rest of the wing.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

57. **Yythima avanta,** *Moore.*—A few specimens obtained at Kohima and at the foot of the hills in January and February.

58. **Ypthima huebneri,** *Kirby.*—A male obtained at the foot of the hills in February and another at Kohima during the same month; the former agrees with specimens in my collection from Barrackpore, but the latter differs in being much paler and in having the forewings more pointed.

59. **Erebia orixa,** *Moore.*—Fairly common on grass slopes, 6,000—7,000 feet in September and October.

60. **Melanitis ismene,** *Cramer.*—Wet season forms taken commonly at Kohima in August and September, and dry season forms from September to November. A few specimens also obtained at the foot of the hills in August and November.

61. **Melanitis bela,** *Moore.*—Fairly common from the foot of the hills up to 6,000 feet. Dry season forms obtained from February to May and again from August to December and wet season forms in August.

62. **Cyllogenes janetæ,** *de N.*—Pl. A.; fig 7, ♀. A single female of this rare form obtained at 6,000 feet in September. Mr. Doherty secured a male.

63. **Anadebis himachala,** *Moore.*—Taken not uncommonly at low elevations from July to October.

64. **Neorina hilda,** *Westwood.*—A few specimens obtained at 6,500 ft. in September; Naga Hill specimens seem to be smaller than Bhutan specimens, being only 3·5 inches in expanse; the yellow discal band on the forewing is also paler and of a slightly different tint.

65. **Elymnias undularis,** *Drury.*—Common at the foot of the hills from February to November.

66. **Elymnias malelas,** *Hewitson.*—A few males taken at low elevations in May, July and August.

67. **Elymnias patna,** *Westwood.*—Males obtained at low elevations in July and August.

68. **Elymnias vasudeva,** *Moore*—A single male taken at Gaspani, 1,700 ft., in March.

Sub-family—MORPHINÆ.

69. **Clerome arcesilaus,** *Fabr.*—Recorded from the Naga Hills but not met with by me.

70. **Amathusia amythaon,** *Doubleday.*—Recorded from the Naga Hills.

71. **Thaumantis diores,** *Westwood.*—Two males taken at low elevations in May and November.

72. **Æmona amathusia,** *Hewitson.*—Recorded from the Naga Hills but must be very rare.

73. **Enispe enthymius,** *Doubleday.*—Two males of the variety *tessellata* Moore, were obtained at 2,000 ft. in February and March.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

74. **Enispe cycnus,** *Westwood.*—Several males and two females of this beautiful butterfly were obtained at 6,000 ft. during September and October; they are fond of flying up and down narrow jungle paths and are difficult to catch as the thick jungle prevents the net being handled efficiently.

74*a*. **Discophora tullia,** *Cramer.*—Common at low elevations from March to October.

Sub-family—NYMPHALINÆ.

75. **Charaxes marmax,** *Westwood.*—Taken at the foot of the hills in March, April and August.

76. **Charaxes kahruba,** *Moore.*—Two males taken at Tamlu and Gaspani in August and October.

77. **Charaxes aristogiton,** *Felder.*—Five males obtained at the foot of the hills in April and October.

78. **Charaxes hierax,** *Felder.*—I have not taken typical *hierax* in these hills but it will probably occur; I follow Bingham in considering all the banded forms to be varieties of this form—

(1) Variety, **hipponax,** *Felder.*

Typical forms taken at the foot of the hills in March and April; it is a most variable form and merges into form *jalinder* in one direction and into form *pleistonax* in another; it is impossible to place some of the intermediate forms under any typical varietal form satisfactorily.

(2) Variety, **naganum,** n.

I propose this name for the narrow yellow banded forms which Moore considers to be a variety of *C. hipponax* and which are peculiar to the Naga Hills. It is certainly a very distinct form and worthy of a name. Three males taken in April at the foot of the hills are very small, only measuring 2·85 inches across; rainy season forms taken at Tamlu and at Nichuguard in August are larger.

(3) Variety, **pleistonax,** *Felder.*

A single typical male obtained at Nichuguard in August.

(4) Variety, **khasiana,** *Butler.*

Two typical males taken at the foot of the hills in April and August, the specimen taken in the latter month has the basal area much darker than the male taken in April. Forms intermediate between this and *jalinder* were also obtained.

(5) Variety, **jalinder,** *Butler.*

This is the commonest form; taken at the foot of the hills from February to September.

79. **Charaxes sulphureus,** *Rothch and Jordan.*—Taken sparingly at the foot of the hills in June, October and November.

80. **Eulepis athamas** *Drury*—Taken commonly throughout the year from the foot of the hills up to 5,000 ft.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

81. **Eulepis arja,** *Felder.*—Not uncommon at the foot of the hills throughout the year. A single specimen was taken as high as 4,000 ft. in August.

82. **Eulepis Schreiberi,** *Godart.*—Recorded from the Naga Hills.

83. **Eulepis moori,** *Distant.*—Recorded from the Naga Hills.

84. **Eulepis eudamippus,** *Doubleday.*—Not uncommon. Males taken at the foot of the hills in March and April and at Tamlu in August.

85. **Helcyra hemina,** *Hewitson.*—Recorded from the Naga Hills.

86. **Apatura ambica,** *Kollar.*—Males exceedingly common at the foot of the hills throughout the year; a few also taken up to 4,500 ft. in October.

87. **Apatura sordida,** *Moore*—A single male of this rare butterfly was obtained near Kohima at about 5,000 ft. in October and I also received a female from the adjacent state of Manipur taken in November. I believe this form has hitherto only been recorded from Sikhim.

88. **Apatura chevana,** *Moore.*—A single male of this beautiful butterfly was taken at the foot of the hills in July.

89. **Apatura parisatis,** *Westwood.*—Males exceedingly common at the foot of the hills throughout the year.

90. **Apatura florenciæ,** n. sp. Pl. A, figs. 5 and 6 ♂ Male. *Upperside*: forewing; basal area brown with a greenish golden sheen; the rest of the wing brownish-black with the following markings :—a yellow discal band composed of three large spots, the upper one almost filling the apex of the cell, the middle one filling the basal third of interspace 2 but not reaching its base and the lower one placed near the tornal angle in interspace 1; a postdiscal transverse band, composed of three yellow linear spots in interspaces 6, 5 and 4, a large diffuse spot in interspace 3 and small diffuse spots in interspaces 2 and 1, commencing at the costa beyond its middle and ending near the tornus; a small diffuse yellow spot beyond the postdiscal band in interspace 4 above which are two white subapical spots in interspaces 5 and 6. Hindwing, dusky greenish-brown with a golden sheen; costal area brownish-black; interspaces 5 and 6 yellowish near their bases and with diffuse yellow spots near their outer thirds, also a minute yellow spot in interspace 4; a black spot ringed with yellow ochre in interspace 2, a submarginal band consisting of yellow ochre lunules inwardly bordered by dark diffuse spots decreasing in width towards the tornal angle and stopping at vein 2; a narrow black marginal line outwardly bordered with yellow ochre.

Underside: pale greenish-yellow somewhat suffused with silvery; forewing, a discal yellow macular band as on upperside but paler, the upper spot inwardly very diffuse, the middle one inwardly bordered with chestnut and the lower one placed in a purplish-grey area which fills interspace 1 and reaches the dorsum; beyond this band in interspace 2 is a large black spot; the postdiscal band as on upperside but paler, the three upper

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spots greenish or yellowish-white inwardly bordered with chestnut, the lower spots very indistinct; subapical spots as on upperside; a pale chestnut marginal line bordered on both sides with greenish-white. Hindwing: a greenish-white discal band, inwardly bordered with chestnut as far as vein 2, commencing a little beyond the middle of the costa, where it bends sharply outwards, slightly curves outwards as far as interspace 4 and then inwards as far as the middle of interspace 2 and then again outwards towards the tornal angle which it does not quite reach; a subtornal black spot, centred with white and ringed with yellow, in interspace 2, above which a postdiscal series of four greenish or yellowish-white spots in interspaces 3, 4, 5 and 6, the lower ones sometimes indistinct; a pale chestnut marginal line bordered on both sides with greenish-white.

Abdomen and thorax: upperside yellowish-brown, underside bluish-grey. Eyes reddish-brown. Palpi reddish-brown above and yellowish-white below. Antennæ blackish-brown above and yellowish-brown below with a little white speckling near the base; club black.

Expanse 2·64—2·72 inches.

This is a well marked form and seems to be intermediate between *A. ulupi*, Doherty, and *A. pallas*, Leech, from both of which it is however quite distinct. It is decidedly a rare butterfly and in two years collecting only nine males were obtained, seven in September and October at 5,000 ft. and two in May at the foot of the hills. The female is apparently still rarer and I did not manage to get one. I was at first inclined to think that this form was *A. ulupi*, but on comparison with the co-type of that species in British Museum it proved abundantly distinct. It can be at once distinguished from *A. ulupi* on the upperside by its darker colour and by the black discal band between the yellow bands being immaculate and not broken up into a distinct spot in interspace 2; and on the underside by its greenish colour, in *ulupi* it is yellow; the discal band on the hindwing is angled in the middle whilst in *ulupi* it is nearly straight.

90. (*a*) **Apatura parvata**, *Moore*.—Apparently very rare. A single male taken at Jakama, 5,000—6,000 feet, in October.

91. **Dilipa morgiana**, *Westwood*.—Rather rare; taken at the foot of the hills in March and June and at 5,000—6,000 ft. from July to October. The female is very rare and I only succeeded in obtaining one in August. Most of the specimens were taken in March and October.

92. **Hestina nama**, *Doubleday*.—Very common throughout the year from the foot of the hills up to 6,000 ft.

93. **Parhestina persimilis**, *Westwood*.—A single male taken at Gaspani, 1,700 ft., in October. Two females were also taken by my Native Collector in Manipur during the same month. I believe this form has not previously been recorded further east than Sikhim.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

94. **Euripus halitherses,** *Doubleday.*—Males taken commonly at the foot of the hills and upto 2,000 ft. Also a single specimen as high as Kohima. A few specimens of the female form *isa*, Moore, were obtained in April, July, October and November and a single specimen of the form *cinnamomeus*, Wood-Mason, was obtained at 4,500 ft. in October. The females are by no means common.

95. **Sephisa chandra,** *Moore.*—A single male taken at the foot of the hills in May and several males and a single female (Moore's fourth form) taken near Kohima in September and October. Several more were seen flying round the tops of the trees in my garden. A female was seen as late as December, it was benumbed in the cold and I nearly succeeded in catching it with my fingers, having no net with me at the time. The female differs in structure a good deal from the male in having the palpi much longer than in that sex and in the specimen obtained it is nearly three times as long. This peculiarity, which gives the insect a curious effect, does not appear to be recorded by either de Nicéville, Moore or Bingham.

96. **Neurosigma doubledayi,** *Westwood.*—Recorded from the Naga Hills, but I have not met with it.

97. **Stibochiana nicea,** *Gray.*—Not uncommon at the foot of the hills from January to August and as 5,000—6,000 ft. from September to November. A dry season form taken in January is much smaller, the postdiscal blue band on the hindwing is not sinuous and is better defined; the subterminal spots have the inner blue border and outer white border broader, the latter almost reaching the termen, the black central spots very small and the terminal black line very narrow; all the blue markings are much paler and brighter. Figure 2, plate 217, Lep. Ind., vol. iii evidently is intended to represent this extreme dry season form.

98. **Symphœdra khasiana,** *Swinhoe.*—A few specimens taken at the foot of the hills in April, June and October. The males differ from my Bhutan specimens in having the ochreous spots on the forewing more conspicuous and the terminal band more developed in some specimens almost as in S. dirtea, the subterminal band on the hindwing is also bluer and not so violescent. The solitary female taken has all the spots tinged with ochreous. The form from these hills appears to be intermediate between the form from Bhutan and S. dirtea from Burma.

99. **Dophla nara,** *Moore.*—Two males taken in July and eight males in August at 5,000—6,000 ft.

100. **Dophla sahadeva,** *Moore.*—Males not uncommon from July to October at 4,600 to 6,000 ft. Females are rare. Fresh specimens were only obtainable in July and August and towards the end of the latter month all the specimens taken were battered.

101. **Dophla derma,** *Kollar.*—Apparently rare; a single female taken at 1,700 ft. in March and another was seen.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

102. **Euthalia lepidea,** *Butler.*—Fairly common at the foot of the hills throughout the year.

103. **Euthalia appiades,** *Ménétriés.*—A few specimens taken at the foot of the hills in February, March and November.

104. **Euthalia jahnu,** *Moore.*—Obtained by Mr. Doherty in the Naga Hills.

105. **Euthalia kesava,** *Moore.*—A few specimens taken at the foot of the hills, April to July.

106. **Euthalia lubentina,** *Cramer.*—Two females taken in April and a male in August at 1,700 ft.

107. **Euthalia franciæ,** *Race* **attenuata,** n.—Under the above name I propose separating the Eastern race of *E. franciæ*, from the Khasia and Naga Hills, from the typical form occurring in Sikhim and Bhutan. It can easily be distinguished by its much darker colour and by the bands being very much narrower; in only one specimen that I have seen is it as broad. The colour of the discal band is very variable; in many specimens there is a tendency for the spot to become white and in some specimens the bands are entirely white. This form is not uncommon at 5,000—6,000 ft. from August to October.

108. **Euthalia phemius,** *Doubleday.*—Occurs at the foot of the hills, a few specimens taken in June, August and October.

109. **Euthalia telchinia,** *Ménétriés.*—A single female taken at Gaspani, 1,700 ft., in July.

110. **Euthalia garuda,** *Moore.*—Not common probably from the absence of its food plant. A single male taken at the foot of the Hills in August is much darker than any specimen I have seen and has the white discal spots very small, the spot in interspace 4 being wanting.

111. **Euthalia jama,** *Felder.*—A single male taken at the foot of the hills in March which is smaller than specimens in my collection from Bhutan and the Khasia Hills being only 2·41 inches in expanse. The markings on the underside are very pale and the white streaks hardly visible.

112. **Euthalia apicalis,** *Vollenhoven.*—A male taken at the foot of the hills in March and a female in June. The male agrees with the figure of *E. eriphyle* de N. as figured in Lep. Ind. iii, pl. 238, (2) and the female agrees with the figure of *E. apicalis,* Lep. Ind. iii, pl. 239, (1b.) except that the discal spots are longer. I have placed both under *E. apicalis* following Bingham who considers *E. eriphyle* de N. to be same as this species.

113. **Parthenos gambrisius,** *Fabr.*—Fairly common at the foot of the hills. The males of the spring brood have the apices very white, whilst in the summer broods there is only a trace of this as if the wings had been slightly rubbed.

114. **Moduza procris,** *Cramer.*—Common throughout the year at low elevations.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

115. **Liminitis zayla,** *Doubleday.*—Not uncommon at 6,000—7,000 ft. in the latter half of August and the beginning of September. The females seem to be very rare.

116. **Liminitis daraxa,** *Doubleday.*—Very common, many specimens taken from June to November at the foot of the hills and up to 7,000 ft.

117. **Liminitis dudu,** *Westwood.*—Males rather common at 6,000—7,000 ft. from August to November; a few were also taken at 1,700 ft. in April. Females appear to be very rare and none were taken.

118. **Lebadea martha,** *Fabr.*—Not uncommon at the foot of the hills from June to August.

119. **Auzakia danava,** *Moore.*—A single male taken at 1,700 ft. in August and many males at 5,000—7,000 ft. during September and October. Specimens taken in August and September are larger and darker than those taken in October; one specimen taken in October is as small and pale as specimens from the N.-W. Himalayas but as a rule they are a good deal larger and darker.

120. **Pantoporia inara,** *Doubleday.*—Dry season forms taken at the foot of the hills in February and November and wet season forms in July, August and September.

121. **Pantoporia kanwa,** *Moore.*—Recorded from the Naga Hills, but I have not met with it.

122. **Pantoporia cama,** *Moore.*—Not uncommon; the autumn form which is intermediate between the summer and spring forms was obtained in October and November at 2,000 ft. and up to 5,000 ft. The spring form, which is the smallest and palest, was obtained at 2,000 ft. in April and the summer form, which is the darkest and largest, was taken from the foot of the hills up to 5,000 ft. from June to August.

123. **Pantoporia selenophora,** *Kollar.*—Males very common at low elevations; one was taken as high as 4,600 ft. Small spring broods taken in February, and summer broods from June to October, and one specimen as late as November. The autumn brood which is intermediate between the summer and spring broods began to appear in October, many specimens being taken in November.

124. **Pantoporia zeroca,** *Moore.*—Not very common; dry season forms taken at the foot of the hills in November and wet season forms in July and August at 1,700 ft. to 4,600 ft.

125. **Pantoporia orientalis,** *Elwes.*—This Eastern form of *P. opalina* is not uncommon at 4,500—7,000 ft. from June to November. It differs from *P. opalina* from the N.-W. Himalayas in having the white bands narrower.

126. **Pantoporia ranga,** *Moore.*—A few specimens taken at low elevations from July to November.

127. **Athyma perius,** *Linn.*—An extremely common butterfly throughout the year.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

128. **Athyma asura,** *Moore.*—Three males taken at Gaspani, 1,700 ft., in August and October.

129. **Neptis astola,** *Moore.*—Very common; wet season forms taken at Kohima from August to November and dry season forms in February.

130. **Neptis varmona,** *Moore.*—Not so common as the last; dry season forms taken at the foot of the hills and at Kohima in February.

131. **Neptis yerburii,** *Butler.*—Taken at 5,000 ft. from July to November, but not commonly; the form from these hills have the white bands somewhat narrower than the form from the N.-W. Himalayas.

132. **Neptis soma,** *Moore.*—A few specimens taken at the foot of the hills in January and February.

133. **Neptis guilta,** *Swinhoe.*—Recorded from the Naga Hills.

134. **Neptis cartica,** *Moore.*—Recorded from the Naga Hills, but I have not met with it.

135. **Neptis radha,** *Moore.*—Mr. Doherty obtained this in the Naga Hills but it must be very rare.

136. **Neptis ananta,** *Moore.*—Not uncommon from July to October. Two wet season form males taken at the foot of the hills in July and August and many males of the dry season form with pale yellow bands were taken at 5,000—6,000 ft. from August to October; it is curious that I only obtained the form with the dark bands at low elevations and the form with the pale bands at high elevations.

137. **Neptis miah,** *Moore.*—Not uncommon at the foot of the hills in June and July; a single male was also taken in March.

138. **Neptis viraja,** *Moore.*—Recorded from the Naga Hills, but I have not met with it.

139. **Rahinda hordonia,** *Stoll.*—A few males taken at low elevations in February and August.

140. **Cyrestis thyodamas,** *Boisduval.*—A single male was taken at Kohima in September and another was seen; it does not appear to be common.

141. **Chersonesia risa,** *Doubleday.*—Two males obtained at Nichuguard in June.

142. **Junonia iphita,** *Cramer.*—Very common throughout the year in the neighbourhood of Kohima. Dry season forms taken in February, May, November and December, and wet season forms from August to November.

143. **Junonia lemonias,** *L.*—Common at low elevations, not taken above 4,000 ft. The autumn brood is intermediate in coloration and depth of markings between the summer and spring broods, specimens of the latter taken in February are very small and pale underneath.

144. **Junonia orithya,** *Linn.*—A very common butterfly throughout the year in the neighbourhood of Kohima.

145. **Junonia atlites** *Johannson.*—Not common, a few wet season forms taken in October and November at the foot of the hills and below Kohima

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

4,000 ft. A dry season male taken in February at the foot of the hills is very small and has the apex of the forewing distinctly truncated; on the underside the ocelli are quite wanting and both wings are crossed by a dark conspicuous dark lilacine brownish-grey band.

146. **Junonia hierta,** *Fabricius.*—Fairly common at low elevations.

147. **Junonia almana,** *Linn.*—Not uncommon; dry season forms taken in February and October at the foot of the hills up to 4,500 ft. Wet season forms taken in October.

148. **Vanessa cardui,** *Linn.*—Very common throughout the year at about 5,000 ft.

149. **Vanessa indica,** *Herbst.*—Common throughout the year at 5,000-6,000 ft.

150. **Vanessa canace,** *Johannsen.*—Rather common from July to October at 4,000-6,000 ft.; less plentiful in the Winter.

151. **Araschnia dohertyi,** *Moore.*—Fairly common, appearing first on the wing in August, fresh specimens fly up to the beginning of October. Two worn specimens taken as late as 7th November. Not seen below 5,000 ft., most of the specimens were taken at 6,000-7,000 ft.

Bingham remarks "a slightly divergent form. Differs from *prorsoides* in the white not ochraceous discal band on the upperside of the wings, and the more slender terminal markings."

In his description he also states that most of the markings are *white*. In all my *fresh* specimens these markings are *yellow*, the two spots in interspaces 3 and 4 only inclining to white, in some specimens these also are quite yellow. In some *worn* specimens these yellow markings become whitish and in a few specimens *all* the markings are white on both wings; I think it likely that Bingham's description is based on a worn specimen; Mr. Elwes gives excellent figures of both sexes in his notes on Naga Hill butterflies previously referred to. This butterfly has, I believe, only been recorded from these hills.

152. **Symbrenthia lucina,** *Cramer.*—Common throughout the year. The seasonal forms do not vary much; a specimen taken in February, the height of the dry season is as dark as any wet season form. It occurs from the foot of the hills up to 6,000 ft.

153. **Symbrenthia hypselis,** *Godart.*—Rather common. There appear to be three seasonal forms (1) a large dark form taken commonly at about 5,000 ft. and sparingly at 1,700 ft. from July to November; (2) a small form with broader and paler fulvous markings (*S. cotanda*, Moore) taken in October at 5,000 ft. and at the foot of the hills in February and March; (3) an intermediate form taken at 1,700 ft. in June and July.

154. **Symbrenthia niphanda,** *Moore.*—Rare, only two males and a female obtained in two years' collecting at 5,000-6,000 ft. in August and October.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

155. **Rhinopalpa polynice,** *Cramer.*—Recorded from the Naga Hills, but I have not met with it.

156. **Hypolimnas bolina,** *Linn.*—Very common as low elevations throughout the year; rather scarce below Kohima at about 4,000 ft.

157. **Penthema lisarda,** *Doubleday.*—Has been recorded from the Naga Hills.

158. **Doleschallia continentalis,** *Frühstorfer.*—Very common at low elevations from May to July; scarce near Kohima from September to November.

I have not seen *D. malabarica* from South India, but *D. continentalis* from North India and Assam can always be distinguished from the Ceylon form by having the termen at the apex between veins 7 and 9 *concave,* in all Ceylon forms that I have seen it is either straight or even *convex.*

159. **Kallima inachus,** *Boisduval.*—Fairly common from the foot of the hills upto 6,000 ft. from March to November.

160. **Kallima knyvetti,** *de N.*—Rather rare, several males and one female taken at 5,000—3,000 ft. from July to November, my last specimen, a female, being taken on 6th of November. This beautiful butterfly appears to be very local and keeps to thickly wooded ravines; perfect specimens are difficult to obtain.

161. **Cethosia cyane,** *Drury.*—Not common, taken at the foot of the hills upto 4,600 ft. in January and from July to November. It is not nearly so common as *C. biblis.*

162. **Cethosia biblis,** *Drury.*—Exceedingly common at 4,000—7,000 ft. from July to September; a few specimens also taken in January and February at the foot of the hills; these only differ from the summer brood in being smaller. The grey variety of the female was very rare.

163. **Cynthia erota,** *Fabr.*—Males fairly common throughout the year, females rather scarce. Small dry season forms taken at the foot of the hills from January to March; intermediate forms taken at foot of the hills and up to 4,600 ft. in April and November, and wet season forms at foot of the hills up to 4,600 ft. from June to October.

164. **Atella phalantha,** *Drury.*—Common, from August to November from the foot of the hills up to 4,600 ft.

165. **Issoria sinha,** *Kollar.*—Taken commonly at low elevations, April to December, and near Kohima from August to November.

166. **Cupha erymanthis,** *Drury.*—Rather scarce; wet season forms taken at the foot of the hills in May and August and at 4,600 ft. in October; a single male of the dry season form taken at the foot of the hills in the latter half of November.

The wet season form is larger and darker than specimens from Kumaon in my collection.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The dry season form taken in November differs from the wet season form in being smaller and on the upperside paler; underside paler and the markings not so pronounced and without any trace of the reddish-ochreous round discal spots; the yellow discal fascia on the forewing is slightly darker and not such a clear yellow as in the wet season form and almost of the same shade as the ground colour giving the whole of the undersurface a very uniform appearance.

167. **Cirrhochroa mithila,** *Moore.*—Not uncommon: taken at the foot of the hills in May, October and November and at 4,500—5,000 ft. in October.

168. **Cirrhochroa aoris,** *Doubleday.*—Not very common; obtained at the foot of the hills from March to November and at 5,000 ft. in July.

169. **Angynnis childreni,** *Gray.*—Fairly common in gardens at Kohima from July to October.

170. **Argynnis hyperbius,** *Johanssen.*—Very common throughout the year near Kohima.

171. **Ergolis ariadne,** *Johanssen.*—Not uncommon at low elevations in February.

172. **Ergolis merione,** *Cramer.*—A single female taken near Kohima at about 3,000 ft. in October.

173. **Pseudergolis wedah,** *Kollar.*—Not uncommon at 5,000 ft. from August to November.

174. **Calinaga brahma,** *Butler.*—Five males and a female taken in my garden at Kohima in April and May; several more were seen flying round the tree tops; they were difficult to catch as they seldom came within reach of the net. The flight is rather like that of *Danais tytia.*

Sub-family—ACRÆINÆ.

175. **Pareba vesta,** *Fabr.*—Very common in August and September. Numerous pupæ were brought to me at the end of August, all attached to blades of *ekra* grass.

Sub-family—LIBYTHEINÆ.

176. **Libythea lepita,** *Moore.*—A few specimens taken at 1,700 ft. and 5,000 ft. in March and October.

177. **Libythea myrrha,** *Godart.*—Taken sparingly in April and November at 1,700 ft. and in October at 5,000 ft.

FAMILY—NEMEOBIDÆ.

178. **Dodona dipœa,** *Hewitson.*—Taken sparingly from September to December at 5,500—6,500 ft.

179. **Dodona eugenes,** *Bates.*—Taken sparingly at 6,000—7,000 ft. from August to December.

180. **Dodona egeon,** *Doubleday.*—Bingham records this from the Naga Hills. I have not met with it.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

181. **Dodona ouida,** *Moore.*—Taken commonly above Kohima 6,000—7,000 ft. during August and September. At the end of November and beginning of December a fresh brood appeared at a lower elevation, when many specimens were taken in my garden in Kohima; this brood averaged smaller than specimens taken in September, the difference in size being especially noticeable in the females.

182. **Dodona adonira,** *Hewitson.*—Rather uncommon. Males taken near running water, sucking up the moisture from the sand, at 5,500—6,500 ft., from October to December. Females were not taken.

183. **Abisara fylla,** *Doubleday.*—Males common, females very rare from August to December at 4,000—7,000 ft.

184. **Abisara neophron,** *Hewitson.*—Recorded from the Naga Hills. I have not met with it.

185. **Abisara chela,** *de N.*—Obtained by Mr. Doherty in the Naga Hills.

186. **Zemeros flegyas,** *Cramer.*—Very common in gardens at Kohima. Three well marked seasonal forms occur.

(1) Summer brood with markings well defined, taken from July to October.

(2) Autumn brood darker and larger than the summer brood taken from September to December.

(3) Winter brood, much smaller and paler than the summer brood with all markings small and indistinct, taken from December to February.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART V.

(With Plates XVIII—XXV, and text-figures 13—19).

(Continued from page 995 of Volume XX.)

CORYPHA UMBRACULIFERA, L. Sp. Pl. 1187 (1753); Gaertn., Fruct., I. 18, t. 7; Roxb. Fl. Ind. II. 177; Mart. Hist. Nat. Palm. III, 232, t. 108, 127 (partim); Griff. in Calc. Journ. Nat. Hist. V. 319; Palms Brit. India 116; Dalz. and Gibs., Bombay Fl. Suppl. 94; Kurz For. Fl. II, 525; Brand. For. Fl. 549; Hooker, Fl. Brit. Ind. VI, 428; Trimen, Fl. Ceyl. IV, 328; Talbot Trees Bomb. ed. 2, p. 343; Prain, Bengal Pl. 1090; Brandis, Ind. Trees 657.—*C. gebanga*, Kurz For. Fl. II, 525.—*C. macropoda*, Kurz in Journ. As. Soc. Beng. XLIII, II. 197; For. Fl. II, 525.[1]

NAMES.—Talipot Palm; Fan-Palm; Tala (Ceylon); Condapana (Tam.); Sidalum (Tel.); Talee (Beng.); Coddapana (Mal.).

DESCRIPTION.—Trunk erect, straight, cylindric, 30-80 feet high, with a diameter of 2-3 feet, annulate. Leaves 8-16 feet in diameter, sublunate or circular, palmately pinnatifid, plicate, cleft to about the middle into 80-100 linear-lanceolate, acute or 2-fid lobes; petiole 5-10 feet long, very stout, the margins armed with short, compressed, dark-coloured spines. Spadix pyramidal, 10-20 feet long, decompound, shortly and stoutly peduncled; peduncle clothed with tubular spathes which are pierced by the primary branches, branchlets forming pendulous spikes. Calyx broadly 3-lobed; petals oblong, about $\frac{1}{12}$ inch long. Ovary suddenly contracted into the style. Drupe shortly stipitate, globose, $1\frac{1}{2}$ inch in diameter, with 2 abortive carpels at its base, greyish olive-coloured

[1] *Corypha gebanga* Kurz and *C. macropoda*, Kurz have been referred to *C. umbraculifera* by Prain.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

TALIPOT PALM IN FLOWER.

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

roughish ; seeds globose, very hard, smooth and polished. (Fig. 13).

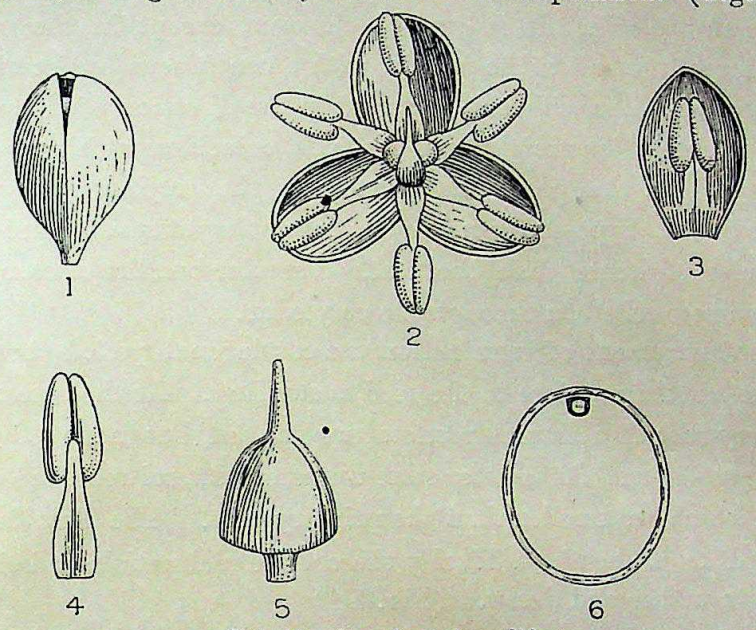


FIG. 13.—*Corypha umbraculifera.*

1. Corolla just before opening.
2. Open corolla seen from above.
3. Petal with stamen.
4. Dorsal view of stamen.
5. Longitudinal section through pistil.
6. Vertical section of seed.

1—5 enlarged. (After Martius).

HABITAT.—Ceylon : in the moist low region below 2,000 feet, rather common ; Malabar Coast ; Kanara : moist forests of the Kumpta and Honavar talukas of Northern Kanara, covering extensive areas near the Gairsoppa and Yena rivers, also on the Yellapur Ghats ; sometimes planted in gardens near the coast ; South Andaman Islands ; Little Coco ; Great Coco ; cultivated in tropical India and Burma.

Hooker makes the following remark in Trim. Fl. Ceyl. IV. 328 : "This must be a native palm [of Ceylon], but I have never seen it in original jungle. Of the vast number of seedlings which come up near the parent tree, very few arrive at maturity, the young leaves being continually cut. Beddome remarks that he has never seen it wild in S. India."

FLOWERS.—November to January.

GERMINATION.—The development of the young palm has been observed by Gatin.[1] The seed is globose with uniform albumen.

[1] Gatin, C. L., Recherches Anatomiques et Chimiques sur la Germination des Palmiers. Paris, 1906, p. 248.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The embryo has the shape of a short cylinder with an elongated cone on top of it. It is covered all over, except in the central portion of the end of the radicle, with a continuous epidermis, the cells of which are slightly elongated in the direction of the radius. The plumule is straight and its axis coincides with that of the embryo. In the peripheric portion of the cotyledon there are three or four hypo-epidermic layers consisting of smaller and more granular elements than the rest. Vascular bundles of elongated and narrow cells run through the cotyledon.

At the moment of germination the cotyledonal petiole becomes longer and forms, close to the seed, a swelling. At the base of the primary root thin lateral rootlets are formed, but none of these bear root-hairs. At a later state numerous lateral roots are developed which are smaller than the primary root. The first leaf is reduced to a sheath. Finally the cotyledonal petiole and sheath begin to wither and decay. (Fig. 14.)

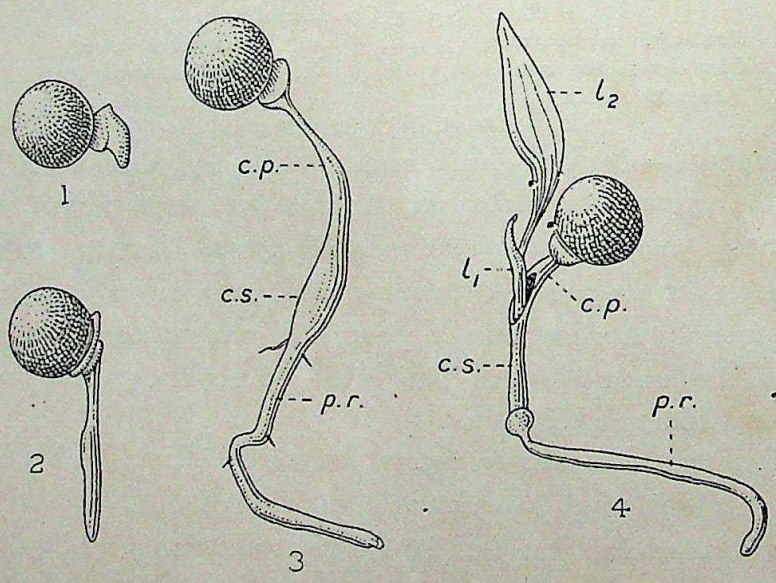
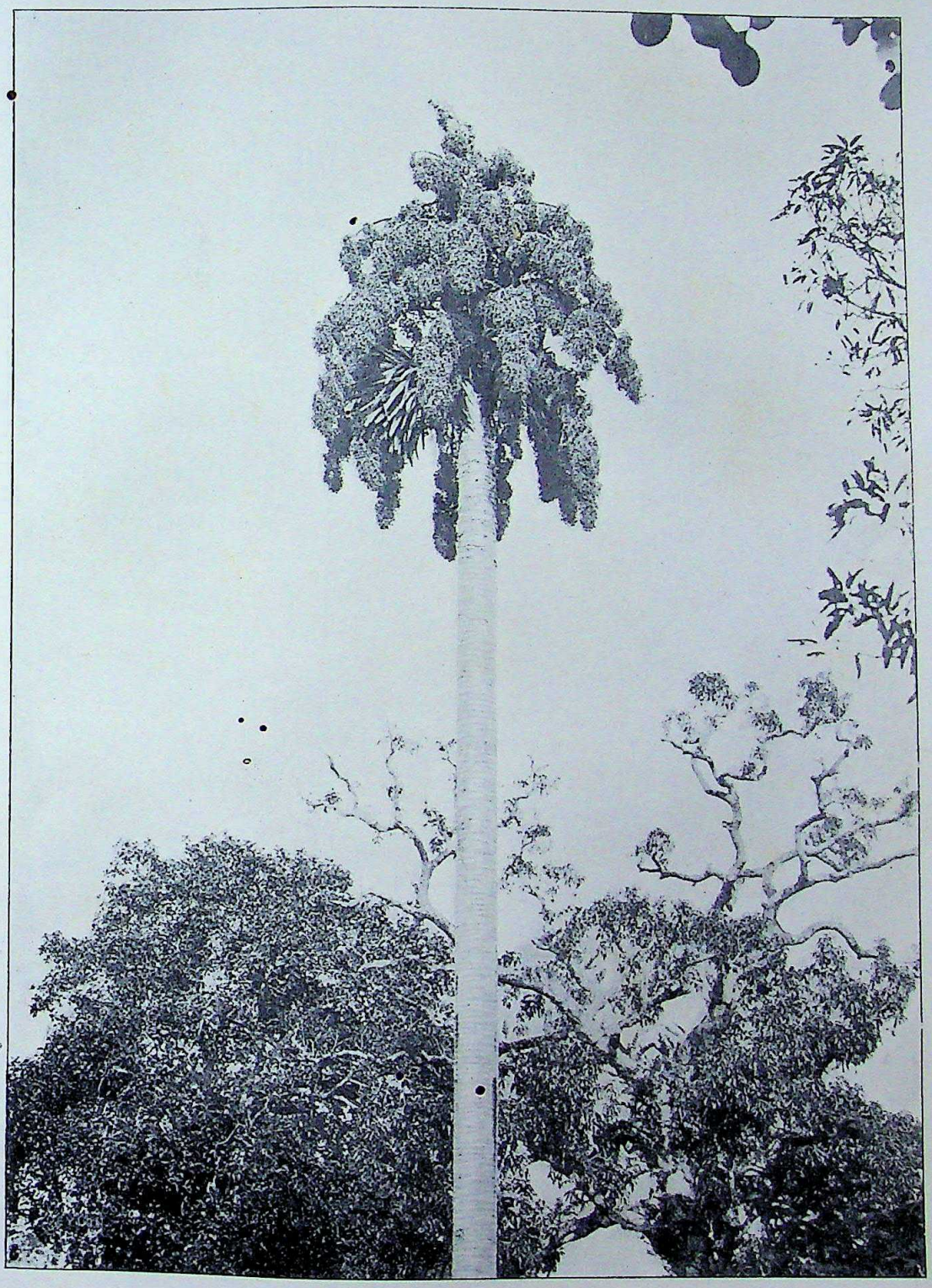


FIG. 14.—Successive stages in the germination of *Corypha umbraculifera*.
c. p = cotyledonal petiole. *p. r.* = primary root.
c. s. = cotyledonal sheath. *l*1. and *l*2. = first and second leaf.

USES.—The leaves are extensively used by the lower classes of Singalese as umbrellas. They are extremely well adapted for that purpose, one outspread leaf affording sufficient shelter for seven or eight persons. Umbrellas made of the leaves are largely exported

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



TALIPOT PALM BEARING SEED.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

from Kanara. Some of the sacred records of the Singalese are written on pieces of the blade of these leaves with either a brass or iron style. It has been asserted by various authors that such records have resisted for ages the ravages of time, by others it has been denied. Under the native government of Ceylon each person was allowed, according to the social station he occupied, to have a certain number of the gigantic leaves of the Talipot, folded up in the form of fans, borne before him.

In Ceylon they beat the pith of the stem in mortars to flour and bake cakes of it, which taste much like white bread; it serves them instead of corn before their harvest is ripe. The seeds are nearly as hard as ivory and are extensively employed in the manufacture of beads, or are coloured and sold as coral; or even made into small bowls. In Europe they are used in the manufacture of buttons. They are known in the trade as bazarbatu, bajurbet or bayurbatum nuts, and a fairly considerable export in these goes from Bombay. The trade is chiefly carried on by Arabs. It is not improbable that after the removal of the pith, the long fibro-vascular cords of the stem might be employed in the same way as the fibre of *Caryota urens*.

Robert Knox's quaint description[1] of the Talipot is worth quoting, though it may contain some repetitions of what we have said above: "It is as big and tall as a ship's mast, and very straight, bearing only leaves which are of great use and benefit to this people, one single leaf being so broad and large that it will cover some fifteen or twenty men, and keep them dry when it rains. The leaf being dried is very strong and limber, and most wonderfully made for men's convenience to carry along with them, for though this leaf be thus broad when it is open, yet it will fold close like a lady's fan, and then it is no bigger than a man's arm. It is wonderfully light; they cut them into pieces and carry them in their hands. The whole leaf-spread is round almost like a circle, but being cut in pieces for use are near like unto a triangle; they lay them upon their heads as they travel, with the peaked end foremost, which is convenient to make their way

[1] In "An Historical Relation of the Island of Ceylon, by Robert Knox, a captive there near twenty years." London, 1681.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

through the boughs and thickets. When the sun is vehement hot they use them to shade themselves from the heat; soldiers all carry them, for besides the benefit of keeping them dry in case it rain upon the march these leaves make their tents to lie under in the night. A marvellous mercy, which Almighty God hath bestowed upon this poor and naked people in this rainy country."

ILLUSTRATIONS.—Plate XVIII shows a gigantic specimen of the Talipot Palm in flower. In its youth it devotes itself to producing only huge fan-shaped leaves; later on a trunk begins to form which grows straight as a mast. The grand white stem is encircled with closely set ring-marks, showing where it has born and shed its leaves from year to year. When the Talipot attains full maturity, it grows somewhat smaller leaves, and develops a gigantic bud some four feet in height. In due course this bursts with a report, and unfolds a lovely white blossom which expands into a majestic pyramid of cream-coloured flowers, which rise to a height of twenty feet above the leafy crown. At the same time the leaves begin to wither and cover in this state for some time the upper part of the stem, as may be seen in our picture.

Plate XIX shows the same palm a short time after. The magnificent bloom is succeeded by the fruit which consists of innumerable nuts or seeds. It now begins to droop and within a year it falls dead. (Plate XX.)

CORYPHA TALLIERA, Roxb. Cor. Pl. III, 251, t. 255, 256; Fl. Ind. III, 174; Kunth Enum. III, 236; Mart. Hist. Nat. Palm. III, 231; Griff. in Calc. Journ. Nat. Hist. V, 317; Palms Brit. Ind. 114, t. 220, E. F.; Wall. Cat. 8616; Hook. Fl. Brit. Ind. VI, 428; Brandis, Ind. Trees, 658.—*Talliera bengalensis*, Spreng. Syst. Veg. II, 18.—*T. taleti*, Mart. in Roem.—Schult. Syst. VII, 1306.

NAMES.—Tara, Tallier, Tareet (Beng.).

DESCRIPTION.—Trunk perfectly straight, about 30 feet high, equally thick throughout, obsoletely annulate, dark brown, rather rough. Leaves palmate-pinnatifid, subrotund, complicate above the middle, sub-glaucous, 6 feet long, 15 feet broad, 90-100-fid, lobes deeper and broader than in *umbraculifera*, the central 3-3½ feet, basal ones overlapping; petiole 5-10 feet long, not spirally

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE LAST STAGE OF THE TALIPOT PALM.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

arranged, bi-auricled, remarkably strong, upper side deeply channelled, the sharp margins armed with numerous, short, strong dark-coloured, polished, compressed spines. Spathes as many as there are primary and secondary ramifications in the spadix, all smooth and obtuse. Spadix 20 feet or more high, supradecompound; primary branches alternate, round, spreading nearly horizontally with their apices ascending; secondary ramifications alternate, bifarious, compressed, drooping, recurved, soon dividing into numerous, variously curved, smaller, subcylindric branchlets covered with innumerable, small, white, odorous, subsessile flowers. Calyx minute, obscurely 3-lobed; petals 3, oblong, concave, fleshy, smooth; stamens 6, nearly of the length of the petals, at the base broad, and somewhat united; anthers ovate, dorsifixed. Ovary, 3-lobed, 3-celled, suddenly contracted into the style; style shorter than the stamens; stigma simple. Drupes 1-3 $1\frac{1}{2}$ inch in diameter, wrinkled, dark olive or greenish-yellow, pulp in small proportion, and yellow when the fruit is ripe. Seed solitary, round, attached to the base of the drupe, white, horny, with a small cavity in the centre; embryo apical. (Fig. 15.)

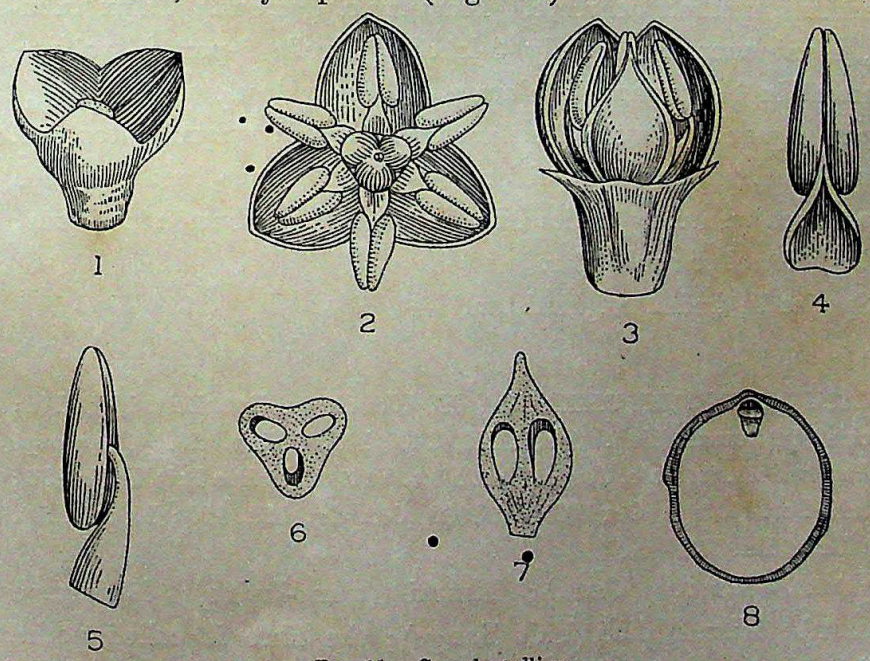


FIG. 15.—*Corypha talliera.*

1. Calyx.
2. Open flower seen from above.
3. Longitudinal section of flower showing 2 stamens and pistil.
4. Ventral view of stamen.
5. Side view of stamen.
6. Transverse section of ovary.
7. Longitudinal section of ovary.
8. Longitudinal section of seed.

1—7 magnified. (After Martius).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HABITAT.—Bengal.

FLOWERS.—At the beginning of the hot season; fruit ripens 9 or 10 months afterwards.

USES.—The leaves are used for writing upon with pointed steel bodkins; besides for tying the rafters of the native houses, as they are strong and durable. The wood is not applied to any useful purpose.

NANNORHOPS, H. Wendl. Bot. Zeitg. 1879, 147.
(From the Greek "Nannos", a dwarf and "rhops", a low shrub.)
Griff. Palms Brit. Ind., 135.; Aitch. Journ. Lin. Soc. 19, 140, t. 26.—Benth, and Hook. Gen. Pl. III. II, 923,84; Boiss. Fl. Or. V. 47, app. 754.

A gregarious, tufted, low-growing, glabrous palm; stems or rhizoms robust, prostrate, branching. Leaves cuneately flabellate, rigid, plicate, split into curved 2-fid segments; petiole short. Spadix axillary (intrafoliar), much-branched; spathes tubular, sheathing, spathels ochreate. Flowers polygamous. Calyx tubular, membranous, unequally 3-lobed. Corolla 3-partite, valvate. Stamens in hermaphrodite flowers 6, in male flowers about 9. Ovary 3-gonous; ovules basilar; style short; stigma 3-toothed. Drupe small, globose or oblong, 1-seeded; style basilar. Seed free, erect, ventrally hollowed, hilum small; albumen uniform; embryo dorsal or subbasilar.

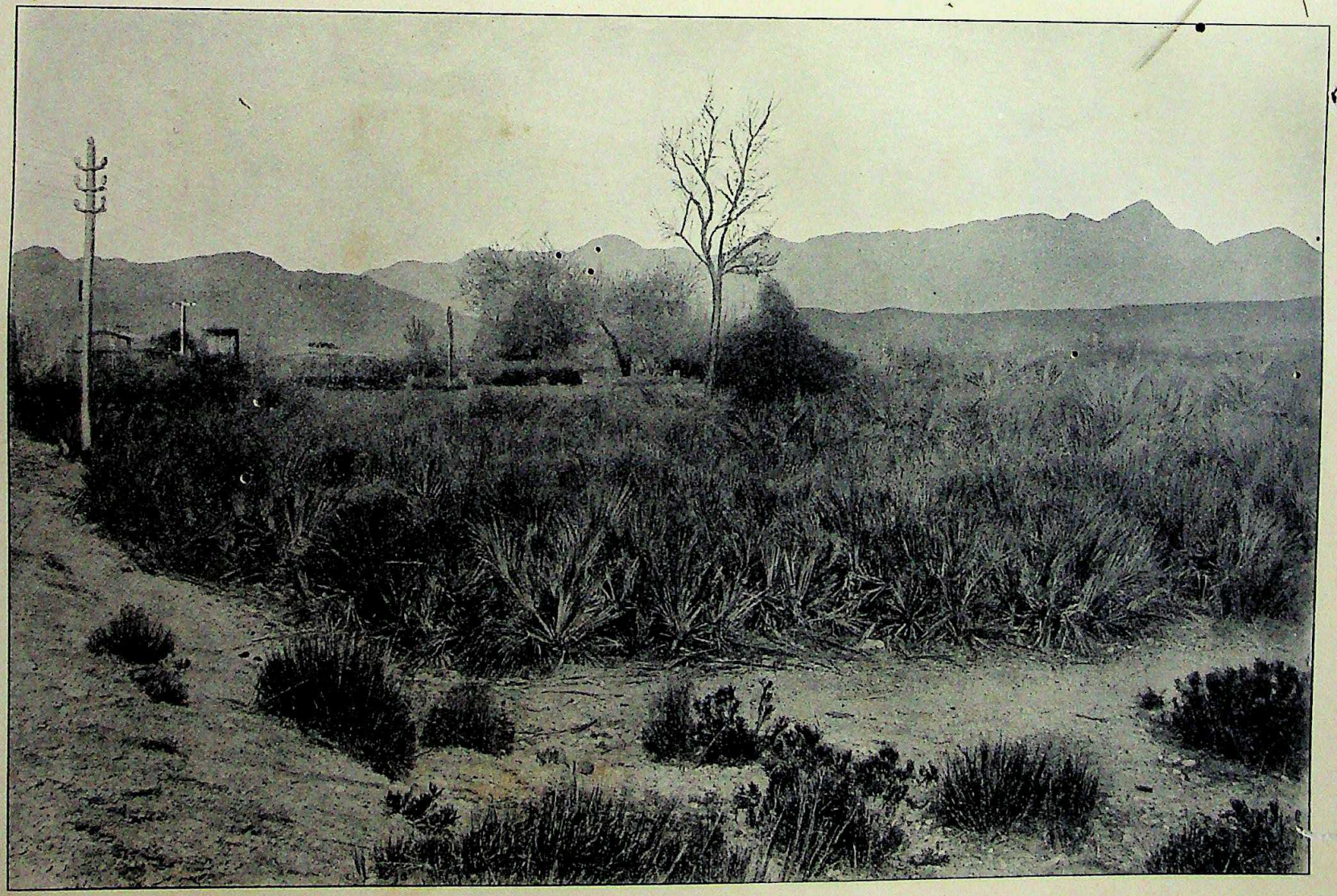
Species 1; India, Afghanistan.

NANNORHOPS RITCHIEANA, H. Wendl. in Bot. Zeit. 1879, 148; Aitchis. in Journ. Linn. Soc. XIX, 140, 141, 187, t. 26. *Chamærops ritchieana*, Griff. in Calc. Journ. Nat. Hist. V. 342; Palms Brit. India 135; Brandis For. Fl. 547; Gard. Chron. 1886, 652, fig. 128, 129; Mart. Hist. Nat. Palm. III. 252.

NAMES.—Mazari (Vern.); Mzarai (trans-Indus); Maizûrrye (Pushtu); Kilu, Kaliun (Salt Range); the fibre is called patha in the Punjab; Pfis, Pesh, Pease, Fease, Pfarra, Dhora (Sind, Baluchistan).

DESCRIPTION.—A low gregarious shrub, the leaves usually tufted from an underground much-branched rhizome 8-10 feet long, as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



A LANDSCAPE IN BALUCHISTAN BETWEEN SIBI AND QUETTA, SHOWING A DENSE GROWTH OF MAZARI PALMS (*Nannorhops ritchieana*, H. Wendl.).

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

thick as a man's arm, sometimes from an erect branching stem, reaching 20 feet high. Leaves 2-4 feet long and broad, cuneately flabellate, rigid, plicate, greyish-green, consisting of 8-15 linear rigid segments 12-15 inches long, with often interposed fibres, folded, 2-partite; petioles unarmed, 6-12 inches long; base of petiole without any reticulate inner layer, but with a mass of rust-coloured wool. Flowers polygamous, male and hermaphodite. Spadix pyramidal; branches ascending and recurved; branchlets slender; branches and branchlets arising from the axils of tubular, membranous, sheathing bracts with prominent, reticulate, longitudinal nerves; branchlets bifarious, with numerous flowers in the axils of turbinate, membranous, sheathing bracts, with a thin membranous edge. All the bracts are closed sheaths, with a short, subulate or triangular apex; they are spirally arranged, though apparently distichous on the principal axis and the main branches. Flowers in pairs in the axils of hyaline bracts, distinct or connate, and bicuspidate. Calyx thinly membranous, flat, 3-toothed. Petals connate at the base. Stamens 6, sometimes 9 in the male flowers, in the male flowers inserted in the corolla-tube, in hermaphrodite flowers in its throat; anthers sagittate, attached at the back above the base to the subulate filaments. Ovary 3-celled, narrowed into the short style. Fruit an ovoid or subglobose 1-seeded drupe, with the rudiments of 2 abortive carpels, supported by the marcescent calyx, petals, and the remains of the filaments, $\frac{1}{2}$-$\frac{3}{4}$ inch in diameter surface minutely wrinkled; albumen horny, with a central cavity.

Beccari is of opinion that there exist several forms of *Nannorhops ritchieana* on account of its wide distribution in the arid region of Western India, Baluchistan and Afghanistan. He says that the seeds show marked differences, some being spherical, others oval, some measuring $\frac{1}{3}$ inch in diameter, others $\frac{2}{3}$ inch. The seeds are said to be very hard and the albumen homogeneous.[1]

GERMINATION.—The successive stages in the development of this palm, as observed by Holm,[2] are given in figure 16, which

[2] Beccari, O. Notizie sul '*Nannorhops Ritchieana*' H. Wendl. Webbia, vol. i (1905), p. 73.

[1] Holm in "Memoirs Torrey Bot. Club," Vol. II.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

shows the following details in natural size :—

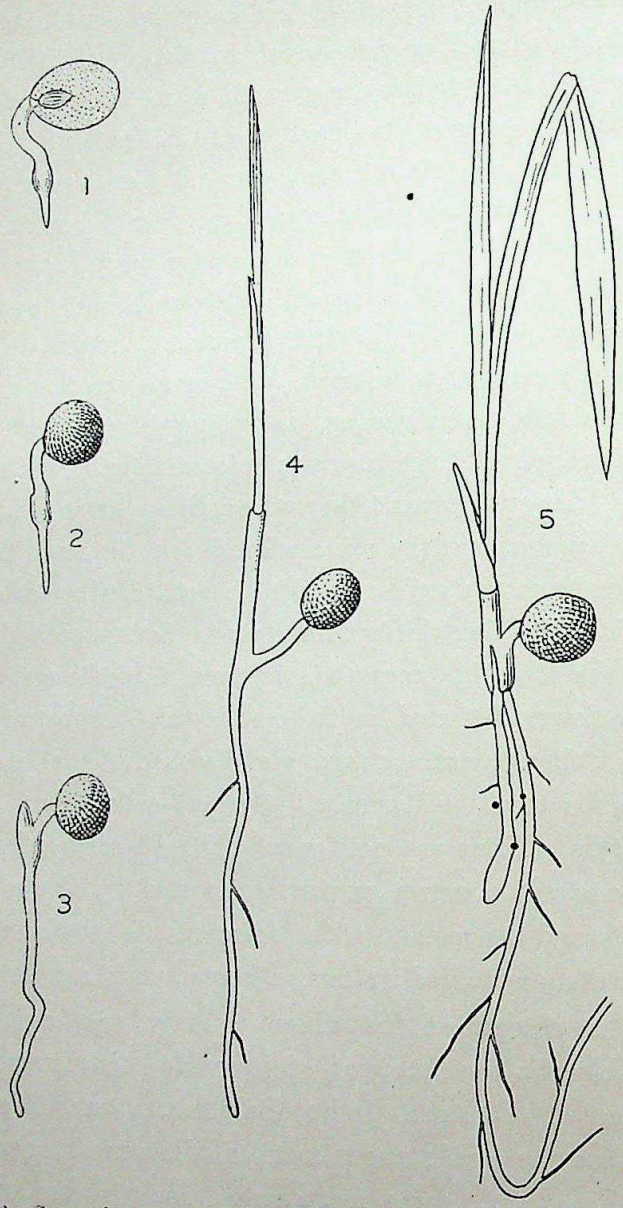


FIG. 16.—Successive stages in the germination of *Nannorhops ritchieana*. Natural size. (After Holm).

1. A longitudinal section through a germinating plantlet in the first stage.
2. The same a little older.
3. An older germinating plantlet, where the plumule has commenced to break through.
4. A young plant with two leaves developed and with the fruit still attached.
5. The same, but older, where the primary root has ceased to grow, and the first secondary root has come out.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HABITAT.—Sind, Baluchistan, Punjab, Afghanistan: Abundant in the Peshawar Valley, in Kohat, and in the trans-Indus territory along the eastern skirts of the Suliman range, ascending up to 3,000 feet; on the hills which form the western boundary of Sind; common locally on a limited area in the central Salt range, between 2,500 and 5,000 feet, and on Mount Sakesar; in one place in the Siwalik tract east of the Jhelam, near Sumani above Bhimbur; common in the Khaiber Pass, and generally in the low arid mountains of eastern Afghanistan; everywhere up to 5,000 feet in Baluchistan and Mekran, except near the coast.

FLOWERS—From August to November; fruit ripens in summer.

USES.—It is a very useful plant in the arid regions where it is common. The stems, leaves, and petioles serve as fuel; the delicate young leaves are eaten as a vegetable; the reddish-brown moss-like wool of the petioles is impregnated with salpeter and used as tinder for matchlocks; the matting made of the leaves is considered to be superior to that made of *Phœnix*; of the leaves and petioles rope is made; the leaves are also made into fans, sandals, baskets, pouches, and brushes: in the trans-Indus country a rude kind of drinking-cup is made of the entire blade, by tying together the tops of the segments; the seeds are pierced, made into rosaries, and exported for that purpose to Mekka *via* Muskat, from Gwadur on the Baluchistan coast, west of the Indus (Brandis). The leaf-bud or "cabbage," and the young inflorescence, as well as the flesh of the fruit, are commonly eaten.

CULTIVATION IN EUROPE.—This stove-plant grows best in a compost of sandy loam, to which some leaf soil and a little charcoal may be added with advantage. Good drainage is necessary. The palm is propagated by seeds and offsets, if the latter can be procured and detached without injury to the parent plant.

Opinions as to the treatment of this palm seem to be divided. A London Gardener writes that *Nannorhops* is probably one of the hardiest of Fan Palms and that it does not like artificial heat, preferring the temperature of an unheated greenhouse.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

We have no practical experience of the cultivation of this palm, but considering the geographical distribution of the species, we should rather say, that it will prefer an unheated greenhouse to the moist temperature of a hothouse.

Beccari mentions two specimens which he is cultivating in the open in the vicinity of Florence, and he says that the plants are doing very well in the northern Mediterranean region.

ILLUSTRATIONS.—We are indebted to Mr. H. V. Kemball, Mr. R. T. Harrison, and Mr. Advani for the following two photographs:

Plate XXI shows a characteristic landscape in Baluchistan with a dense growth of *Nannorhops*. The palms grow in thick small clusters and are about 6 feet high as a rule. The Railway station which is seen in the photograph is the Nakas Railway station, about 5 hours journey from Sibi towards Quetta side.

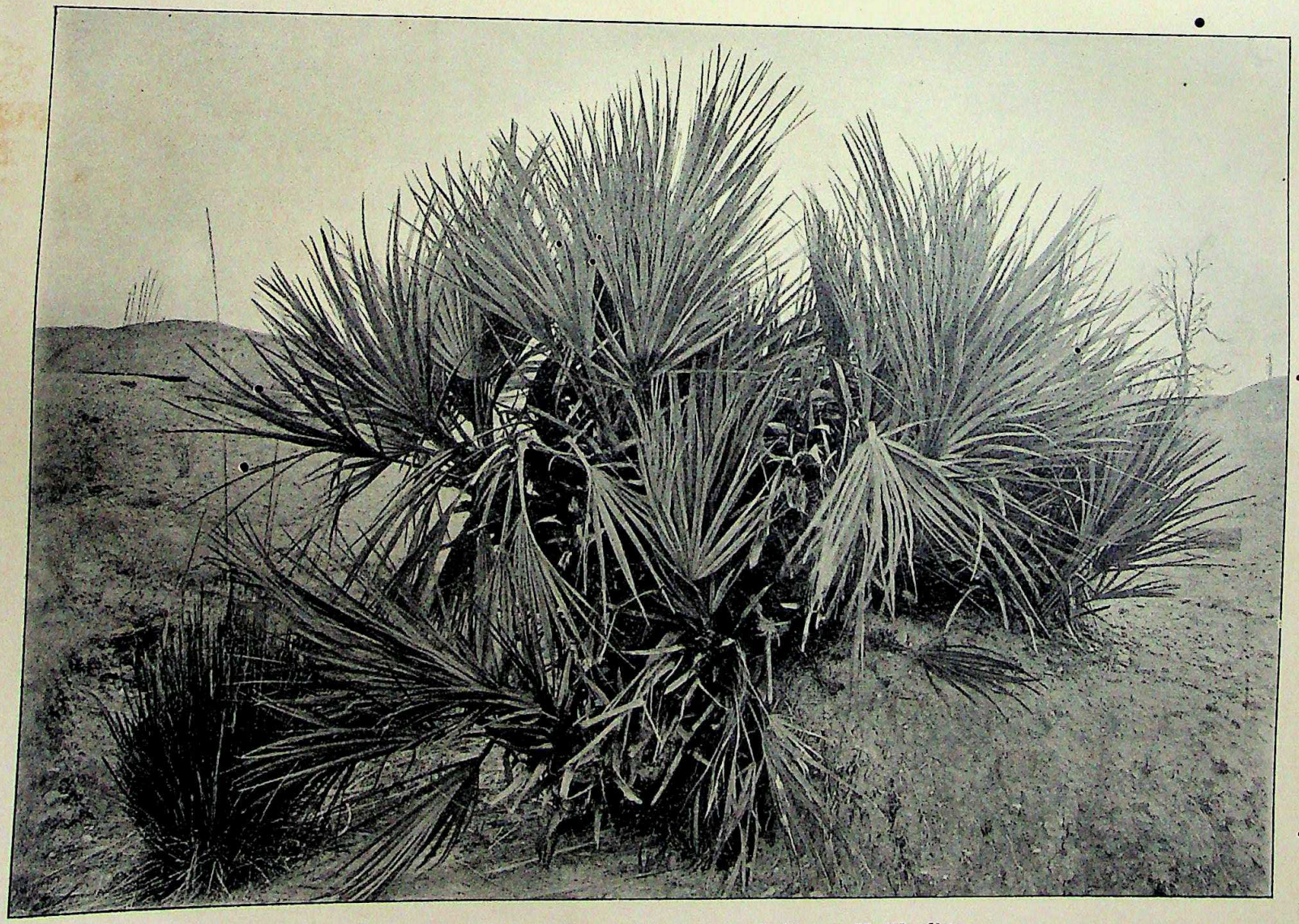
Plate XXII. A cluster of *Nannorhops* from the same place.

LICUALA, Thunb. Acta Holm. 1782, 84.

Gærtn. Fruct. II, t. 139.—Mart. Hist. Nat. Palm. III, 234, t. 134, 135, 162.—Kunth Enum. Pl. III, 238.—Bl. Rumph. II, 37, t. 82, 88-93, II, 47, t. 94.—Griff., Palms Brit. Ind. 117, t. 221 A, B, C, 224-224 A, B.—Miq. Fl. Ind. Bat. III, 51, suppl. 254, 591.—Kurz For. Fl. II, 527.—Walp. Ann. III, 469, V, 815.—Becc. Males. I, 80.—Wendl. & Drude Linn. 39, 191, t. 3, fig. 2.—Benth. Fl. Austr. VII, 144.—Drude Bot. Zeitg. 1877, 638, t. 6, fig. 36-38.—Benth. & Hook. Gen. Pl. III, II, 928, 96.—Hook. Fl. Brit. Ind. VI, 430.

Low, rarely tall palms; stems annulate. Leaves more or less orbicular, or flabellate, plicate, deeply partite; petiole usually spinous. Spadices interfoliar, sheathed by tubular, coriaceous, persistent spathes, simple or branched, glabrous, tomentose or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



A CLUSTER OF MAZARI PALMS (*Nannorhops ritchieana*, H. Wendl.).

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

scurfy; flowers usually small, scattered, hermaphrodite; bracts and bracteoles obscure or absent. Calyx cupular or tubular, mouth 3-fid. Corolla-lobes coriaceous, valvate. Stamens 6; filaments subulate; anthers cordate. Ovary of 3 free or nearly free truncate 1-ovuled carpels; styles filiform; ovules erect. Drupes small; style terminal. Seed erect, globose, free, ventral face often hollowed albumen equable; embryo dorsal.

Species about 50. Asia, Australia, Pacific Islands.

With regard to this genus J. D. Hooker has the following note:—"There are several unnamed Burmese and Malayan-Peninsular species in the Kew Herbarium, which I fail to identify with any of the Indian ones enumerated by Beccari. I refrain from describing them, as they are solitary specimens, and may be the same as known Malayan Island species, of which I have seen no specimens."

CULTIVATION IN EUROPE.—The species of this genus are dwarf stove palms. They grow in a compost of two parts peat and one of sandy loam. They require a strong moist heat. Propagation is effected by seeds sown in a sandy soil, and placed in a strong, moist bottom heat.

* INDIGENOUS SPECIES.

LICUALA PELTATA, Roxb. Fl. Ind. II, 179; Ham. in Mem. Wern. Soc. V, 313; Griff. in Calc. Journ. Nat. Hist. V, 325; Palms Brit. Ind. 120, t. 222; Mart. Hist. Nat. Palms. III, 234, t. 162; Kunth Enum. III, 238; Wall. Cat. 8617; Kurz in Journ. As. Soc. Beng. XLIII, II, 204; For. Fl. II, 527; T. Anders in Journ. L. Soc. XI, 13; Gard. Chron. 1872, 1657, fig. 350; Fl. Brit. Ind. VI, 430; Grah. Cat. p. 225; Prain Beng. Pl. 1091; Brandis Ind. trees, 656.

NAMES.—Kurud, Kurkuti (Beng.) Patti, Chattah-pat (Ass.); Salu (Burm.).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DESCRIPTION.—Stems 8-15 feet high, usually gregarious, marked below with the scars of the fallen leaves, above rough from the persistent bases of the petioles. Leaves orbicular, 3-5 feet in diameter, peltate, 12-30 partite, segments variously connate, many toothed at the apex, teeth ½-2 inches, very variable in length and breadth, obtusely 2-fid. Petiole 6-7 feet long, triangular, armed throughout along the margins, especially towards the base, with stout, horny, black, very sharp, conical, and rather curved spines. Spadix erect, longer than the leaves, stout, simply branched, sprinkled in the upper parts with brown scurf. Spathes tubular, 6-12 inches long, ½-¾ inch broad, mouth irregularly toothed or lobed, at length variously split, and similarly scurfy. Spikes 3-5, solitary, 6-12 inches long, nodding-pendulous, centrifugally developed, fulvous-tomentose, adnate to the axis to about the middle of the spathe. Flowers numerous, on short stalks, solitary, very large, of a greenish-white colour, covered externally with the same pubescence as the spike, opening centrifugally. Calyx campanulate, shortly 3-toothed. Petals. ⅓-½ inch long, lanceolate, coriaceous, reflexed. Stamens 6; filaments united among each other, and to the corolla as far as the base of its segments, thence free, long, stout, plano-subulate, keeled along the back; anthers linear, cordate, exserted, attached near the middle; otherwise the cells are nearly distinct. Ovary turbites, short, with a depressed apex; carpels cohering by their apices. Ovules solitary, erect, anatropous. Style filiform, slender, 3 times longer than the ovary. Stigma obsoletely 3-toothed, on a level with the anthers. Fruit ½ inch long, ellipsoid, narrowed equally at both ends, orange coloured, one-seeded, apiculate by the persistent base of the style, and crowned with the 2-abortive carpels, surrounded at the base by the perianth, the tube of the calyx resembling a short pedicel. Seed oblong, with the intruded hilar process dilated within. Albumen horny. Embryo dorsal, situated

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

below the middle. (Fig. 17).

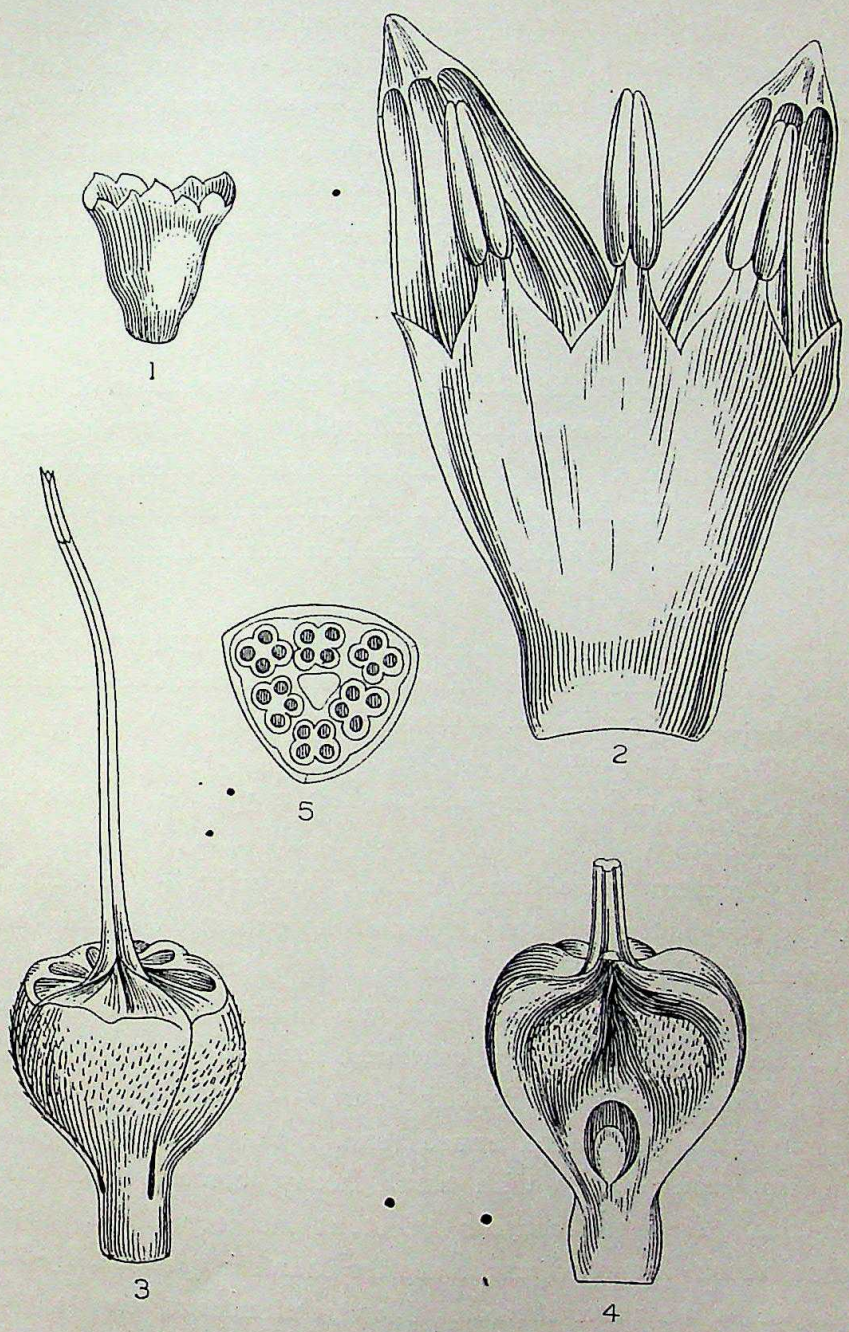


FIG. 17.—*Licuala peltata.*

1. Calyx.
2. Part of corolla spread open with 3 stamens.
3. Pistil
4. Pistil opened, an ovule is visible.
5. A floral diagram after a section through the upper part of the flower.

All much enlarged. (After Martius).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HABITAT.—Sikkim, deep hot valleys near the Teesta river; Assam; Khasia hills; Cachar, woody mountainous country to the east of and near Chitagong. Burma, Upper and Lower, indamp ravines of the Pegu Yoma; Andaman Islands.—Introduced into gardens.

FLOWERS—In the cold season; fruiting in the hot season.

USES.—The leaves, according to Jenkins, are used for the same purposes as those of the Toko-pat, but are much coarser, and only made use of by the lower orders. The demand for them is very great, scarcely a ploughman, cow-keeper or cooly, but has his hat made of chattah-pat.

ILLUSTRATION.—Plate XXIII shows a fine specimen of *Licuala peltata*. From between the round peltate leaves rise 6 simply branched spadices. The branches resemble large catkins on the photograph. We have to thank Mr. H. F. Macmillan who took the photograph in the Royal Botanic Gardens of Peradeniya.

LICUALA LONGIPES, Griff. in Calc. Journ. Nat. Hist. V. 330; Palms Brit. Ind. 125, t. 224, A and B; Kurz in Journ. As. Soc. Beng. xliii. 204; For. Fl. II. 528; Brandis, Indian Trees 656.

NAME.—Plass Bhatto (Malay.)

DESCRIPTION.—Stem very short. Leaves peltate, orbicular, 3-4 feet in diameter, dark green. Segments about 20, the lateral ones being the narrowest, obliquely cut off, unequally 3-4 lobed, lobes irregularly denticulate the terminal one cuneate, 5 inches broad, truncate, 11-keeled above, with as many short, truncate, broad, bifid, denticulate lobes as there are keels; intermediate ones narrower, generally 3-keeled, otherwise similar; the upper margins of all blackish brown. Petioles stout, 4-5 feet long, trigonous, deeply channelled above, armed (except the upper third) along the two inner angles with stout, horny, conical, tooth-shaped prickles. The rete consists of stout leathery fibres. Spadix stout, much branched, much shorter than the petioles, 1½-3 feet long, erect, undulate, flexuose. Flowers numerous, sessile, green, sparsely and sometimes densely pubescent. Calyx subcylindrical, 3-toothed, teeth bifid. Corolla almost twice as long as the calyx, divided to a little below the middle into 3 broad, cordate, lanceolate segments. Filaments short, setiform. Anthers cordato-ovate,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

KURUD (Beng.), PATTI (Ass.) OR SALU (Burm.) (*Licuala peltata*, Roxb.).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

slightly inflexed. Ovary turbinate, towards the base smooth and 3-partible, above entire and villous. Ovule solitary, erect, anatropous. Style cylindric, rather shorter than the ovary, hollow at the apex. Stigmas 3, minute. Fruit seated on the stout pedicel-like tube of the calyx, surrounded at the base by the perianth and annulus of the stamens, apiculate by the style, 1-seeded. Endocarp thin, sub-osseous.

HABITAT.—Tenasserim coast in forests near Lainear to the south of Mergui; Malacca, solitary in dense forests, Ayer Punnus Goonoong Miring, and Mount Ophir, but not above an elevation of a thousand feet.

FLOWERS—Nearly all the year.

LICUALA SPINOSA, Wurmb. in Verh. Bat. Genootsch. II, 469; Roxb. Fl. Ind. II, 181? (excl. syn. Rumph.); Griff. in Calc. Journ. Nat. Hist. V, 321; Palms Brit. Ind. 119; Blume Rumph. II, 39, t. 82, 88; Mart. Hist. Nat. Palm. III, 235, 318, t. 135, 1, 2; Mig. Fl. Ind. Bat. III. 53; Suppl. 254; Becc. Males. III, 74.—*L. paludosa*, Kurz in Journ. As. Soc. Beng. xliii, 528; For. Fl. II, 528.—*L. ramosa*, Bl. in Schult. Syst. VII, 1303; Rumphia II, 39.—*L. horrida*, Blume Rumph. II. 41, t. 89, f. 1; Mart. l. c. 237, 318.—*Corypha pilearia*, Lour. Fl. Cochinch. I, 265.

Beccari has lately reduced to this species his former varieties: *Licuala spinosa* var. *cochinchinensis* and var. *brevidens* Becc. Malesia III. There would be no end of varieties, he says, if all the different forms of a species so widely distributed were to be described. (Webbia, vol. 3 (1910) p. 240.).

NAME.—Plass (Malay).

DESCRIPTION.—Stems stout, 8-10 feet high, 2-4 inches in diameter, densely tufted, rough with the scars of fallen leaves. Leaves orbicular-reniform, about 4 feet across the broad diameter; pinnules about 18 in number, narrow-cuneate; the central ones about 2 feet long; the terminal one is 10- or 11-plicate, truncate, with as many lobes as there are plaits, the lateral ones are the deepest, all are obtusely bifid, the intermediate ones are more or less truncate, 3—5-lobed, lobes larger and deeper, but otherwise similar to those of the terminal one, the lateral ones with oblique 3-lobed ends. Petiole about 4-4½ feet long, obtusely trigonous, margins armed throughout with stout, conical, somewhat curved spines. Ligule very narrow, 1-1½ inch long, scarious. Spathes

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

green, sprinkled with brownish scurf, $\frac{2}{3}$ inch in diameter, with scarious, lacerated ends, occasionally obliquely lacerated. Spadix a little longer than the leaves; branches 7-10, adnate to the rhachis as high as the mouths of the spathes; lower branches several, compound, stout, subulate, downy, spreading, generally secund. Flowers sessile, placed in two's or three's, small, nearly ovate. Calyx sub-ovate, divided to the middle into 3-rounded teeth. Corolla a little longer than the calyx, divided below the middle into 3 broad, lanceolate, acuminate segments. Annulus of stamens rather high, nearly entire. Filaments short, setaceous. Anthers oblong-ovate. Ovary depressed, turbinate, sculptured at the apex. Style filiform, rather longer than the ovary. Fruit obovoid, $\frac{1}{4}$ inch long, pedicelled by the calyx-tube, red, 1-seeded, surrounded at the base by the perianth. Seed ovate; albumen horny, on a transverse section horse-shoe-shaped. (Fig. 18).

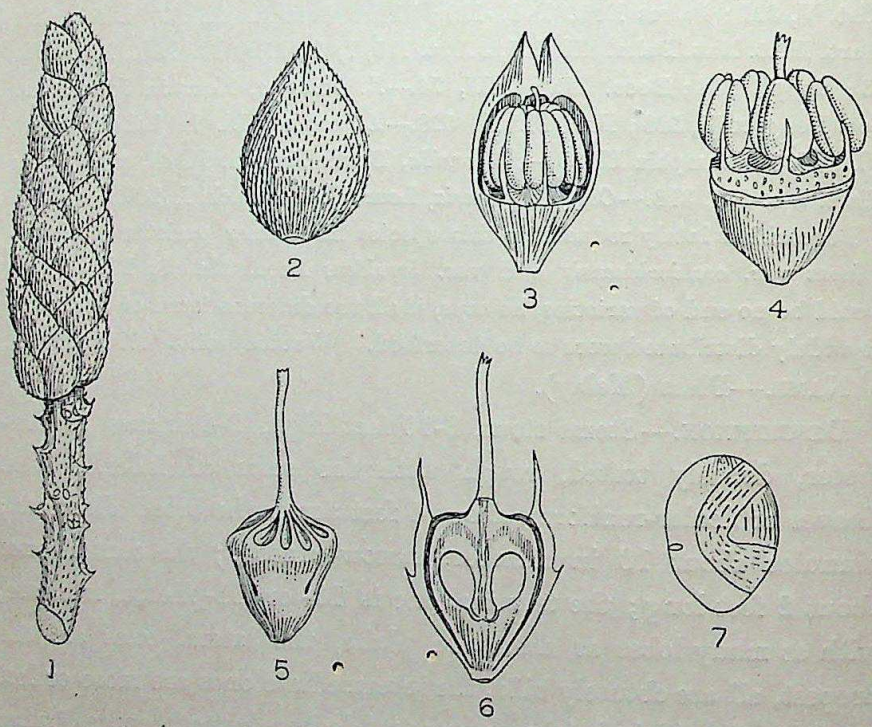


FIG. 18.—*Licuala spinosa.*

1. Top of a flowering branchlet before the flowers open.
2. Young flower.
3. Corolla, one petal removed to show æstivation of stamens.
4. Stamens surrounding the pistil.
5. Pistil.
6. Longitudinal section through pistil to show the ovules.
7. Longitudinal section of seed.

All enlarged. (After Martius).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HABITAT.—Malacca, common in wet places, particularly in hedges; Andaman Islands, tidal forests; Nicobars; Malay Islands.

FLOWERS (in the Bot. Gard. Calcutta,) in the cold season; fruit ripens in the hot season.

CULTIVATION IN EUROPE.—This palm must be kept in the hot-house, and it is well to remember that in its original home this species grows with preference in calcareous soil.

ILLUSTRATION.—*Licuala spinosa* will be figured later on together with *Sabal mauritiæformis*.

* * INTRODUCED SPECIES.

LICUALA PALUDOSA, Griff, in Calc. Journ. Nat. Hist. V, 323; Palms Brit. Ind. 118, t. 221, A, B, C; Hook. Fl. Brit. Ind. VI, 430; Becc. Males. III, 74.

DESCRIPTION.—Stem 4-10 feet high, 3-9 inches in diameter, unarmed, almost without marks of rings, except towards the apex where they are incomplete; crown of moderate size. Rete rather stout, of rich brown colour. Leaves flabelliform or orbicular, 3 feet in diameter, 6-9 partite; lateral segments oblique at the apex, deeply and acutely 3-4 lobed, lobes bilobed (except the side ones), the others are more or less truncate, with 4-8 broad, short, bifid lobes; petiole 1-2 feet long, subtrigonal, armed along the margins, except towards the apex, with small, black, horny, conical, curved spines; sheaths very fibrous. Spathes $\frac{3}{4}$ inch broad, tubular, green, with membranous or scarious, lacerated mouths. Spadix very stout, rather curved; branches of the spadix bearing 5 or 7 spikes, which are 4 or 6 inches long, curved, secund, generally nodding, slightly puberulous, often appearing as if they arose separately from within the mouth of the spathe. Flowers solitary, sessile, of a turbinate form; calyx cup-shaped, $\frac{1}{10}$ inch broad, nearly entire, irregularly split at the expansion of the flower; corolla (in bud) urceolate, about $\frac{1}{3}$ longer than the calyx, divided to the middle into 3 cordate-ovate segments. Ring of the stamens white, nearly entire, projecting considerably above the throat of the corolla; filaments short, setiform; anthers

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

versatile, oblong, pale-brown. Ovary depressed, turbinate, with a horny sculptured apex; carpels adhering by the style; ovules solitary, erect, anatropous; style subulate, rather shorter than the ovary; stigma simple. Fruit spherical, $\frac{1}{4}$ inch in diameter.

HABITAT.—Malacca, low sandy wet places along the sea-coast, about Tanjong Cling, Rundur, and Pulo Bissar, associated with *Pandanus*, *Eugenia*, *Diospyros*, *Helospora*, etc.; Perak; Siam.

Introduced in gardens.

FLOWERS From April to May.

LICUALA ELEGANS, Bl. Rumphia II, 42, tab. 90 A, B.—Becc. Malesia, III, 71.

DESCRIPTION.—Caudex of the thickness of a man's arm, 4 feet long, erect, with transverse scars. Petioles 3-4$\frac{1}{2}$ feet long, the margins with recurved spines, uppermost part of petiole unarmed. Lamina suborbicular, palmatisect, segments about 20, divided almost to the base, the inner ones 16 inches long, linear-cuneiform with the apex straight-truncate, outer ones shorter, linear-lanceolate, with the apex obliquely truncate, all glabrous. Spadix elongate, 7 feet long, rigid; spathes incomplete, vaginate, striate, pale green. Calyx in smaller unripe fruits cupuliform, in ripe ones more cylindrical, at the base depressed-truncate on a very short, tuberculiform pedicel, teeth broadly-ovate, subacute, striate, persistent. Corolla deeply tripartite, longer than the calyx, with a staminiferous ring. Immature fruit turbinate-globose, yellowish-green, apex discoid-dilate. Berries ellipsoid, surrounded at the base by the persistent perianth, with the apex rounded, glabrous, fleshy, 1-seeded. Putamen ellipsoid-globose, obsoletely mucronate at the base, thin, fragile, whitish, outer side fibrous-striate, inner side smooth. Seed spheric—ellipsoidal. Albumen with a large irregular cavity, solid, cartilaginous, white. Embryo dorsal, transverse.

HABITAT.—Sumatra.

ILLUSTRATION.—Plate XXIV shows a well-developed specimen of *Licuala elegans*. At first sight this species might easily be mistaken for *Licuala peltata* (Plate XXIII). The straight-truncate segments, however, distinguish *L. elegans* from *L. peltata*,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Licuala elegans, Bl.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

which even on our picture shows distinctly the many-toothed top of the segments. For other well-marked characters we refer to the description of the two plants.

On the left side of the picture a spadix is visible with the flowering spikes spreading in all directions.

The specimen, taken by Mr. H. F. Macmillan, is growing in the Botanic Gardens of Peradeniya.

LICUALA GRANDIS, H. Wendl. MSS.; Andrè Illustr. Horticol. t. 412; Hook. Bot. Mag. t. 6704 and in Report Kew 1882 (1884) p. 65; Gard. Chron. 1886, 139; Becc. Males. III, 73.—*Pritchardia grandis*, Hort.

DESCRIPTION.—Whole plant about 6 feet high to the base of the topmost petiole; stem leaf-bearing for nearly half of its length, clothed shortly below the leaves with the sheaths of the old leaves, which are semi-amplexicaul and about 3 inches long. Leaves erect and slightly spreading, deep bright green; petiole 2½-3 feet long. slender, concave-convex, armed with short, stiff, nearly straight or curved, sometimes irregularly forked spines along the margins from the base to the middle, ending in a short, ovate, acute, concave, thickly coriaceous ligule; blade sub-erect, 3 feet in diameter, and about two long, orbicular or semi-orbicular, concave from the incurving of the sides and more or less of the whole blade, closely plaited and a little wavy, base cuneate or truncate, margins cleft into bifid lobes about 1 inch long, lobules of the lobes very obtuse. Spadices several, rising from amongst the leaves and nearly as long as they are, sub-erect; rhachis as thick as the little finger, cylindric, terete, quite smooth, giving off at intervals of a foot or less flowering panicles 5-6 inches long. Spathes at the bases of the panicles, two or more, 2-3 inches long, lanceolate, acute, concave, brown, striate. Flowers ⅓ inch long, jointed on to very short pedicels or sessile on the branches of the panicle. Calyx tubular-campanulate, terete; mouth truncate, slightly lobed. Petals as long as the calyx, ovate, acute, concave, very thick, with broad margins and an inflexed tip. Stamens very small, inserted between the triangular teeth of a 6-lobed coriaceous cup; filaments subulate, as long as the teeth of the cup; anthers oblong. Ovary

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of 3 slightly cohering wedge-shaped carpels, united by a very short entire style; stigma simple. (Fig. 19.)

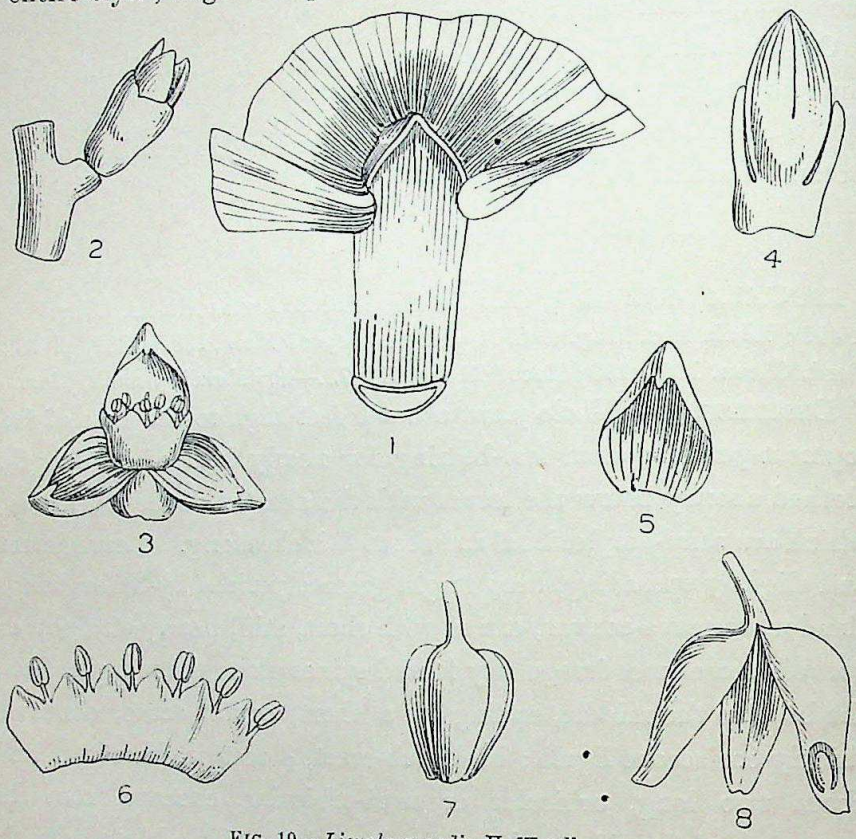


FIG. 19.—*Licuala grandis*, H. Wendl.

1. Top of petiole and base of leaf blade (nat. size).
2. Branch of panicle and flower.
3. Flower spread open.
4. Calyx cut open and petals in bud.
5. Petal.
6. Starminal cup and stamens.
7. Ovary.
8. Ovary with the carpels disunited.

All, except 1, enlarged. (After J. D. Hooker)

Easily distinguished from other species by the spathes not being tubular.

HABITAT.—New Britain.

ILLUSTRATION.—The palm figured on Plate XXV is an old specimen growing in the Botanic Gardens of Peradeniya.

The photograph was taken by Mr. H. F. Macmillan.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE RESIDENT BIRDS OF THE SAUGOR AND DAMOH DISTRICTS, CENTRAL PROVINCES.

BY

R. C. H. Moss King, I. C. S.

This is my first attempt at writing on Natural History matters and I hasten to disclaim all pretentions whatsoever to being an ornithologist; I am only very interested in birds. From what I have read I gather that the apparently most common observations, if only accurate and reliable, apart from interesting bird-lovers, can serve to extend general scientific knowledge of the subject.

All that I lay claim to is that what I have observed I have done accurately and such information as I give is reliable and a fact. That my list is incomplete I know and admit; he would be a bold man who for even the most circumscribed locality would not admit the possibility of an omission; but I guarantee every bird in the list is a permanent resident of the Saugor and Damoh districts, to be found, by those clever enough and with sufficient time to spare, breeding there. Most of them I have been able to find myself. Some have eluded, and a few will doubtless continue to elude, my search, and I have a strong suspicion that the Button-Quails, for example, will be among the latter. But I am perfectly satisfied that every bird mentioned does actually breed here.

I should have preferred to restrict this note to my own district of Saugor, but I have included Damoh for the sake of the water birds and accuracy. The fact is, and I do not attempt to explain it, that all the water-birds and waders seem to prefer, while some appear to restrict themselves to, the Damoh district for breeding. I call this odd, and, like Naaman, exclaim "Are not Chandrapur and Dhamoni, lakelets of Saugor, better than all the waters of Damoh?" Nevertheless does the fact remain that, in the three years watching on which this note is based, I have been totally unable to discover any nesting colony of Egrets, Herons, Snake-birds, etc., in the Saugor district. That they do not breed here is practically inconceivable; on the other hand their nesting is not unobtrusive and ought to be discoverable, and having failed to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

discover it except in Damoh, where it is multitudinous, that district is included with Saugor as constituting the area to which this note refers.

I have not attempted ordinarily to describe either birds, nests or eggs, for this is done, very excellently, by Oates and Blanford who have throughout been my authorities. In one or two instances I have commented on or added to the information which they give, but my notes are purely topical and my chief object has been simply to record the permanently resident birds of the two districts. My list, which is the result of many miles of tramping and many hours of watching with glasses all over Saugor district and also in Damoh, gives 155 birds as resident and mentions a few more which I have been unable to verify myself. I think a list of, say, 165 birds would practically cover all our resident species.

The local vernacular names which I give differ very considerably from those mentioned in Oates and Blanford as Hindi names, but local variations are, I imagine, the rule rather than the exception. The limitations in nomenclature are striking: some birds have no names at all; in some cases different species of the same genus or family all have well known individual names, *e.g.*, every one of the eight varieties of Larks in the district has its own distinctive name and any native who knows anything about birds at all will not only recognize each name but pick out and differentiate each particular lark from all the others. On the other hand, there are whole different families which have to rest content with one common name, *e.g.*, Bagla, applied indiscriminately and without differentiating epithets to Storks, Herons, Ibises and practically to any long legged wader. I have only given names perfectly well known and in common use in the district.

The subject of birds imitating other birds' calls is very fascinating. My notes mention a case of the King-crow imitating the Shikra, a performance for which the former is well known among the natives, and which is done deliberately and for a definite object. The Harewa, Jerdon's Chloropsis, goes even one better, following up the sharp cry of the Shikra with an imitation of the alarm and distress note of the common Bulbul, a combination which will drive every bird in hearing into cover. Mr. Tucker had a tame

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Harewa who used to go about the garden repeating this performance whereupon every other bird fled like Catiline who, on the discovery of his conspiracy, "abiit, excessit, evasit, erupit." Apart from these two instances of what is, on the part of the King-crow at any rate, imitation with practical intention and purpose, birds produce the songs of others, apparently for amusement. The Larks, Indian Sky-lark, Ganges Sand-lark, Singing Bush-lark, Crested Lark and Sykes's Crested Lark, are all good at imitation, while one of the best of all is perhaps the Rufous-backed Shrike, who when in the mood will imitate one bird after another most beautifully.

My acknowledgments, which I here gratefully record, are due to various people for much valuable help and information; to Mr. Tucker who gave me most material assistance at the beginning, the most difficult time of my observations; to Mr. Chenevix Trench and Mr. Thornhill, both keen naturalists and bird-lovers; and lastly to Maula Baksh, most stalwart of Chaprasis, whose knowledge of local birds, while requiring check, is, like Sam Weller's of London, extensive and peculiar.

N.B.—The first number given against each bird in the following list is the serial number of the bird in the Fauna of British India Series—Birds by Oates and Blanford.

4. (1). CORVUS MACRORHYNCHUS. Jungle Crow.
Pahari or Jangal Kauwa.

7. (2). CORVUS SPLENDENS. Indian House Crow.
Kauwa.

16. (3). DENDROCITTA RUFA. Indian Tree-pie.
Chota Mahuka.

43. (4). MACHLOLOPUS HAPLONOTUS. Southern Yellow Tit.
Gulsabdaroshan.

Nests in June. Last year I found three nests, two with four and one with five eggs. As Oates and Blanford say the dimensions of the eggs are not recorded. I may mention that these three clutches averaged ·74 × ·55, excluding one very small egg which only measured ·69 × ·51.

105. (5). ARGYA CAUDATA. Common Babbler.
Chota Genga.

110. (6). CRATEROPUS CANORUS. Jungle-Babbler.
Genga or Satbhai.

139. (7). PYCTORHIS SINENSIS. Yellow-eyed Babbler.

These are the only Babblers that I know of in Saugor. The large Grey

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Babbler (*Argya malcolmi*) and Rufous-bellied Babbler (*Dumetia hyperythra*) might both be expected, but I have not been able to find either myself.

226. (8). ZOSTEROPS PALPEBROSA. Indian White-eye.

Motichur.

Nests in May and June. Oates and Blanford say the eggs are "generally two." I have never found two but either four or three, all pale blue without any marks.

243. (9). ÆGITHINA TIPHIA. Common Iora.

Chota pilak.

252. (10). CHLOROPSIS JERDONI. Jerdon's Chloropsis.

Harewa.

Oates and Blanford give the eggs as "two in number" but I found a nest with three on 3rd June 1909. The usual number is two.

278. (11). MOLPASTES HÆMORRHOUS. Madras Red-vented Bulbul.

Bulbul.

I have never seen either the Bengal Red-vented (*Molpastes bengalensis*) or the white-eared Bulbul (*Molpastes leucotis*) though both from their distribution should occur in Saugor.

321. (12). SITTA CASTANEIVENTRIS, Chestnut-bellied Nuthatch.

325. (13). SITTA FRONTALIS. Velvet-fronted Blue Nuthatch.

I include both these birds on the authority of Mr. Tucker who has seen them both in Saugor throughout the year, though he has not found their nests. I have not myself observed either of these Nuthatches in the district.

327. (14). DICRURUS ATER. Black Drongo.

Karanjua.

This is the only Drongo that I have myself seen in Saugor, but Mr. Tucker tells me he has seen the white-bellied Drongo (*Dicrurus cærulescens*) on various occasions at different seasons of the year and though he never found a nest, there is no reason why it should not breed in the district. Mr. Thornhill told me of an amusing incident which he had witnessed in connection with the Black Drongo. King-crow was sitting on a Telegraph wire, and on the ground below a couple of Mynas and a Hoopoe were making investigations. The Mynas had just discovered a nice plump worm over which they were wrangling when suddenly the cry of the Shikra (*Astur badius*) was heard, so unmistakeable that Mr. Thornhill looked about for the little hawk. The Mynas and Hoopoe tarried not for anything of the kind but legged it for all they were worth to the nearest tree, the former dropping their booty in the excitement. There was not, and never had been, any Shikra about but the King-crow, who had imitated its cry, then swooped leisurely down and absorbed the worm. As a matter of fact the King-crow is particularly fond of this little dodge and the natives are well aware of this habit of his. It involves, of course,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a reasoning power which however I am convinced that nobody who knows anything about King-crow will have any difficulty in accrediting him with. There is a curious superstition among the natives that, if a young King-crow in its first flight from the nest alights on the horn of a bullock, the horn will drop off. This may have a parallel in the similar behaviour attributed to the eyes of the guinea pig if you hold the animal up by its tail.

374. (15). ORTHOTOMUS SUTORIUS. Indian Tailor-bird.
Piddi.

I have found both the reddish white and the bluish-green eggs of this bird, but the former are much the more common.

384. (16). FRANKLINIA BUCHANANI. Rufous-fronted Wren-warbler.

464. (17). PRINIA SOCIALIS. Ashy Wren-warbler.

465. (18). PRINIA SYLVATICA. Jungle Wren-warbler.

467. (19). PRINIA INORNATA. Indian Wren-warbler.
Chitakul.

The latter is the more common of these Wren-warblers, and I have found its nest very distinctly resembling that of the Tailor-bird, so much so that I at first thought the eggs were the blue variety which the Tailor-bird sometimes owns. All of them nest in the rains, in July. As regards the Rufous-fronted Wren-warbler Mr. Tucker has sent me a couple of eggs from a nest found by him in Saugor, and speaks of it as "fairly common;" from the wide distribution given by Oates and Blanford there is no reason why it should not be, but I have not actually come across it myself.

469. (20). LANIUS LAHTORA. Indian Grey-Shrike.
Bara latora.

476. (21). LANIUS ERYTHRONOTUS. Rufous-backed Shrike.
Majhla latora.

484. (22). HEMIPUS PICATUS. Black-backed Pied Shrike.
Chota latora.

488. (23). TEPHRODORNIS PONDICERIANUS. Common Wood-Shrike.

I have never seen a Shrike's larder, but on one occasion, on the march in camp, on riding up to investigate a nest in a thick thorn bush, I found close to the nest, which was a new one in process of building, a full-grown lark, fresh killed, impaled through the neck on a long thorn. A pair of Grey Shrikes were in the vicinity, and that the nest belonged to them there was I think no doubt and the responsibility for the murdered lark it was difficult to dissociate from them, but how they managed to catch it I have never been able to imagine. The Grey Shrike nests early in March and April; the other three varieties wait till June and July. The Wood Shrike's nest is very difficult to find, and being very small and always situated, according to my experience, on the upper side of a fairly stout branch, at the junction of a fork, is quite impossible to see from below.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

500. (24). PERICROCOTUS PEREGRINUS. Small Minivet.
Rájelál.

501. (25). PERICROCOTUS ERYTHROPYGIUS. White-bellied Minivet.
Safed Rájelál.

The latter Minivet is not common; I have only seen it in one place, in the Karta Jungle, and have never found its nest, but Mr. Tucker found one near Rurawan. The small Minivet breeds in April and May. Mr. W. Jesse in his interesting pamphlet on the 'Birds of Lucknow' mentions a very curious fact in connection with this bird, *viz.*, that "with, I think, only one or two exceptions at the most, I have always found nests, whether building or with eggs, in possession of *three* birds, *two* females and one male. What is the exact duty of this second wife I cannot make out." I have looked out for this 'tertium quid' in Saugor but have never seen any sign of her.

508. (26). CAMPOPHAGA SYKESI. Black-headed Cuckoo Shrike.
Chota Bahrám.

510. (27). GRAUCALUS MACII. Large Cuckoo Shrike.
Bahrám.

A very common bird, distinguished for its ridiculously inadequate nest, even more insufficient in comparison with the size of its owner than that of the King-crow.

518. (28). ORIOLUS KUNDOO. Indian Oriole.
Pilak.

544. (29). TEMENUCHUS PAGODARUM. Black-headed Myna.
Pawái Maina.

549. (30). ACRIDOTHERES TRISTIS. Common Myna.
Maina.

555. (31). STURNOPASTOR CONTRA. Pied Myna.
Ablak Maina.

The Pied Myna is nowhere very common but is very generally distributed over the district.

576. (32). CYORNIS TICKELLI. Tickell's Blue Fly-catcher.
Surmai.

598. (33). TERPSIPHONE PARADISI. Indian Paradise Fly-catcher.
Sultana Bulbul.

604. (34.) RHIPIDURA ALBIFRONTATA. White-browed Fantail Fly-catcher.
Chamkul.

All three of these fly-catchers have defeated me at present so far as their eggs go. But Mr. Tucker has found the nest of the white-browed Fantail and also in the gardens behind the Gopalgunj Bazar, which is one of our happy hunting grounds, found one year in June a nest with young of Tickell's Blue Fly-catcher. This latter Fly-catcher is probably more common than it appears to be, for it always haunts thick cover and shade. The Paradise is fairly common in the district while the white-browed

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fantail, with its very distinctive and pretty call, which ends so abruptly and always sounds as if the bird had been interrupted about two notes before the end, is very common indeed ; but I have very rarely seen any of these Fly-catchers, and never the white-browed Fantail, in the vicinity of Saugor itself. The white spotted Fantail Fly-catcher (*Rhipidura pectoralis*) ought to be found here, but I have never come across it. I like the legend, due of course to the difference in the colour of the plumage of mature and immature birds, which Sterndale gives in "Seonee" of the Paradise Fly-catcher, or as he calls it the Rocket-bird. It was originally one of the most beautiful birds in Paradise, all white with twelve long plumes and a lovely voice, but meeting a real bird of Paradise it went and complained to Allah that its own beauty was not sufficiently perfect. Whereon Allah became angry and gave sentence that, as they had shewn an evil spirit and had blackened their faces before him, they should become dingy brown birds with black heads but that after a period of this humiliation they should be allowed to resume their white garb with, however, only two of their tail plumes while their faces should always remain black.

608. (35). PRATINCOLA CAPRATA. Common Pied Bush-chat.
Pidda

629. (36). CERCOMELA FUSCA. Brown Rock-chat.
Sháma.

661. (37). THAMNOBIA CAMBAIENSIS. Brown-backed Indian Robin.
Lálgandi.

663. (38). COPSYCHUS SAULARIS. Magpie-Robin.
Dhayal.

720. (39). PLOCEUS BAYA. Baya.

The lumps of clay, which I have never failed to find inside the weaver-bird's nest, can only be, I think, to weigh the nest and prevent it swinging about too much.

734. (40). UROLONCHA MALABARICA. White-throated Munia.
Churakka.

735. (41). UROLONCHA PUNCTULATA. Spotted Munia.
Sianbáz.

737. (42). STICTOSPIZA FORMOSA. Green Munia.
Harelál.

738. (43.) SPORÆGINTHUS AMANDAVA. Indian Red Munia.
Lál Munia.

Another series of birds, which, with the exception of the white-throated which breeds all the year round, two females sometimes using and bringing up their broods in the same usually untidy and conspicuous nest, have hitherto eluded my search for their nests. I think they only breed here in the rains.

775. (44). GYMNORHIS FLAVICOLLIS. Yellow-throated sparrow.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

776. (45). PASSER DOMESTICUS. House sparrow.
Bamniwallah Chiriya.

Why Sparrows should be locally known as the Brahmins among birds I have never been able to discover. It may be, however, because they indent so freely on, in fact practically monopolise, the hospitality which Brahmins offer in the shape of grain and, in the hot weather, water to birds in general. The eggs of the yellow-throated vary considerably but resemble very much those of the English Tree-sparrow.

803. (46). MELOPHUS MELANICTERUS. Crested Bunting.
Kálá Chandul.

This handsome little bird is very common, nesting in the loose-built stone walls and houses which abound all over the district.

809. (47). COTILE SINENSIS. Indian Sand-martin.

811. (48). PTYONOPROGNE CONCOLOR. Dusky Crag-martin.

818. (49). HIRUNDO SMITHII. Wire-tailed swallow.

819. (50). HIRUNDO FLUVICOLA. Indian Cliff-swallow.

823. (51). HIRUNDO ERYTHROPYGIA. Sykes's striated swallow.

Native name for swallows and martins *Awabil.*

All quite common: I have found the nests of all the four latter in large numbers in the Khurai fort, but have not yet come across a breeding colony of the Sand-martins.

831. (52). MOTACILLA MADERASPATENSIS. Large pied Wagtail.
Khanjan.

The only permanently resident wagtail I believe in Saugor.

847. (53). ANTHUS RUFULUS. Indian Pipit.

Oates and Blanford give the number of eggs as three, but on 21st May 1909, I found a nest with four in the rough grass at the head of Saugor lake, a place where the Pipit and various Larks nest, almost by the dozen.

861. (54). ALAUDA GULGULA. Indian Sky-lark.
Bhárat.

866. (55). ALAUDULA RAYTAL. Ganges Sand-lark.
Retal.

869. (56). MIRAFRA CANTILLANS. Singing Bush-lark.
Aghin.

871. (57). MIRAFRA ERYTHROPTERA. Red-winged Bush-lark.
Jhirjhira.

874. (58). GALERITA CRISTATA. Crested Lark.
Ghágas Chandúl.

875. (59). GALERITA DEVA. Sykes's Crested Lark.
Chandúl.

877. (60). AMMOMANES PHŒNICURA. Rufous-tailed Finch-lark.
Geruwa.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

879. (61). PYRRHULANDA GRISEA. Ashy-crowned Finch-lark.
Dabkul.

All eight of these larks are common. I do not think the Indian Sky-lark, Ganges Sand-lark and Crested lark breed more than once a year about May. Both the Bush-larks and the squat little Ashy-crowned Finch-lark certainly breed twice, in April and again in August-September. It is curious that Oates and Blanford do not mention that both the Red-winged and the Singing Bush-lark's nest is always domed. The Ashy-crowned Finch-lark likes a guard for its nest, preferably a stout thistle.

895. (62). ARACHNECHTHRA ASIATICA. Purple Sun-bird.
Phúl Sungni.

921. (63). PIPRISOMA SQUALIDUM. Thick-billed Flower-pecker.

Both these little birds nest early, about March. I have never found the Sun-birds nest without the little entrance porch. The Flower-pecker's little brown felt woven purse nest with its slit in the side for entrance, and the bottom woven slightly thicker than the rest to keep the sides apart, is the most beautiful example of bird-building that I know.

972. (64). LIOPICUS MAHRATTENSIS. Yellow-fronted Pied Wood-pecker.
Chitla Katkola.

976. (65). IYNGIPICUS HARDWICKII. Indian Pigmy Wood-pecker.
Chota Katkola.

986. (66). BRACHYPTERNUS AURANTIUS. Golden-backed Wood-pecker.
Soná Katkola.

There are, I believe, the only three Wood-peckers found in Saugor. The first and last are both common, the Golden-backed extremely so. The Pigmy Wood-pecker is not so common and I have not found a nest yet but I imagine they breed like the two other species about March. I have seen the Pigmy hop from branch to branch and also come down to the ground in chase of a flying-insect, a habit I have never seen in the other Wood-peckers.

1008. (67). THEREICERYX ZEYLONICUS. Common Indian Green Barbet.

1019. (68). XANTHOLÆMA HÆMATOCEPHALA. Crimson Breasted Barbet.
Hara Katkola.

The latter is ubiquitous, the former not common. Nest in March-April.

1022. (69). CORACIAS INDICA. Indian Roller.
Nilkant.

The Nilkant is a "lucky" bird and on the Daserah day Hindus go out for the express purpose of finding one and it is considered very lucky if the bird is seen flying from right to left. So too old Horace,

"Nec laevus vetet ire picus
Nec vaga cornix."

1026. (70). MEROPS VIRIDIS. Common Indian Bee-eater.
Tiltilla.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1027. (71). MEROPS PHILIPPINUS. Blue-tailed Bee-eater.

The Blue-tailed is not common. I have only seen it in one place in Saugor, at Dewal in the extreme North-West of the district. It occurs in the neighbouring district of Damoh.

1033. (72). CERYLE VARIA. Indian Pied King-fisher.
Chitla Kilkilla.

1035. (73). ALCEDO ISPIDA. Common King-fisher.
Chota Kilkilla.

1043. (74). PELARGOPSIS GURIAL. Brown-headed Stork-billed King-fisher.
Bara Kilkilla.

1044. (75.) HALCYON SMYRNENSIS. White-breasted King-fisher.
Nila Kilkilla.

The Storked-billed is fairly frequently seen. I am certain that a pair have used the wall of the Saugor fort over the lake for nesting, though I have not been able to discover where. The other three kinds are ubiquitous; they all nest about April and May.

1062. (76). LOPHOCEROS BIROSTRIS. Common Grey Hornbill.
Silgilla.

The only Saugor Hornbill, quite common, nests in April. The female can invariably be caught on the nest, has in fact to be removed in order to take the eggs.

1067. (77). UPUPA INDICA. Indian Hoopoe.
Navah.

Very common; the nesting hole is always very odorous, but this has nothing to do, as I have heard it suggested, with any natural smell of the bird itself; it merely contravenes, in common however with many other birds, the precept of not fouling its own nest, the peculiarly far-reaching effect being due, I think, to the nest's situation which is always in a hole.

1073. (78). CYPSELUS AFFINIS. Common Indian Swift.
Awabil.

1086. (79). MACROPTERYX CORONATA. Indian Crested Swift.

Extremely local but in good sized flocks where it does occur. Mr. Thornhill told me that out shooting, observing one of these birds coming constantly to the same branch, he was able from his machán and with his glasses to make out the tiny saucer on the branch which constitutes the nest; it was however quite inaccessible and the eggs of these birds must be difficult to get.

1091. (80). CAPRIMULGUS ASIATICUS. Common Indian Night Jar.
Chapka.

I feel certain that there are other Night-jars in the district, but they are not easy to identify without shooting, which, apart from the fact that

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I only resort to the gun in sheer desperation when every other means of identification have failed, is not so easy as it sounds when it comes to Night-jars.

1104. (81). CUCULUS CANORUS. Cuckoo.
Kuku, or Papaiya.

1109. (82). HIEROCOCCYX VARIUS. Common Hawk-Cuckoo.

1118. (83). COCCYSTES JACQBINUS. Pied Crested Cuckoo.

1120. (84). EUDYNAMIS HONORATA. Indian Koel.
Koel.

1129. (85). TACCOCUA LESCHENAULTI. Sirkeer Cuckoo.

All common except the last which I have only seen on a few occasions. I have never found the Cuckoo's egg, though I flatter myself that I have obtained that of the Pied Crested on more than one occasion from the nest of *Crateropus canorus*. But considering how the eggs are said to resemble those of the legitimate owner, I fail to see how one can be certain, short of seeing the Cuckoo on the nest. And I am afraid that my belief in the genuineness of the egg, apart from a slight though appreciable difference in their shade of blue and size, is largely based on my personal desire to believe. The Koel's eggs are easy to get and last year I took a nest with three Koel's and two Crow's eggs. To my great regret I have never been able to witness any dispute or manœuvring between the Koel and the Crow over the depositing of these eggs in the Crow's nest, and I personally have a theory, based on the undoubted fact that at this particular time of year Koels are awake, and most vocally so, at all hours of the night, that Mrs. K. must often introduce the egg stealthily in the dark.

The Sirkeer Cuckoo is a poor creature, hardly worth calling a Cuckoo as he is said to demean himself so far as not only to lay his own eggs, which according to the small boy of the story no decent Cuckoo ever does, but even to make his own nest. I have never found this nest and do not want to or to have anything more to do with this disreputable bird. Swadeshi is all very well but when it comes to self-made nests for Cuckoos, I consider that it is carried to excess.

Mr. Tucker adds the Indian Plaintive Cuckoo (*Cacomantis passerinus*) to the Saugor list, but I have not come across the bird myself.

1130. (86). CENTROPUS SINENSIS. Common Coucal or Crow-pheasant.
Mahuka.

Nests late in August, making a large globular nest of green leaves and creepers, always very carefully concealed in the thickest of foliage.

1135. (87). PALÆORNIS NEPALENSIS. Large Indian Paroquet.
Karan-tota.

1138. (88). PALÆORNIS TORQUATUS. Rose-winged Paroquet.
Tota.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1139. (89). PALÆORNIS CYANOCEPHALUS. Western Blossom-headed Paroquet.

Chota Tota.

The large Indian Paroquet is the most popular cage bird, so much so that contractors regularly pay for the monopoly of the right to take all the young birds to be found in particular tracts of jungle.

1152. (90). STRIX FLAMMEA. Barn-owl or Screech-owl.

Gugu.

The old fort at Dhamoni is full of these owls.

1161. (91). SYRNIUM OCELLATUM. Mottled Wood-owl.

1164. (92). KETUPA ZEYLONENSIS. Brown Fish-owl.

Gugu.

A most fearsome bird: I shall never forget seeing one of these owls in a big mango tree which, I promptly climbed in the hope of finding the nest. I found the nest all right with two young ones in a large hollow of the trunk; it was late in the evening and getting dark and as I climbed both the parent owls watched me, one each side, from a distance of a few feet. With their huge yellow eyes and most truculent aspect in general they were about as terrifying as tigers and I was expecting a 'charge' at any moment.

1180. (93). ATHENE BRAMA. Spotted owlet.

Chipru.

A very common little owl; it is a most amusing sight to see three or four young ones at the edge of their nesting hole, all glaring and jerkily bobbing and bowing at one like so many little marionettes. I feel sure that there are other species of owls in the district, one of which Mr. Tucker says, is the Jungle owlet (*Glaucidium radiatum*) of which he has seen several pairs. The four above-mentioned are however the only ones I am definitely certain of, and owls, like Nightjars, present difficulties in the matter of identification.

1192. (94). GYPS FULVUS. Griffon vulture.

Gid.

I saw this vulture breeding on a cliff at Mundra.

1196. (95). PSEUDOGYPS BENGALENSIS. Indian White-backed vulture.

Gid.

1197. (96). NEOPHRON GINGINIANUS. Smaller White Scavenger-vulture.

Safed chil.

I believe this is the Saugor vulture and not *Neophron perenopterus*. The latter is said to have the bill dusky, never yellow, and every vulture of this species which I have seen in Saugor has a very distinctly yellow bill. I take this opportunity of warning egg collectors of a dreadful method of defence sometimes adopted by the young of the white-backed vulture, which, when the luckless climber comes within range, deliberately puts its

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

head over the side of the nest and disgorges on him. Memo: to send up a hireling in future to investigate a Vulture's nest and to stand well from under the tree oneself.

1203. (97). AQUILA VINDHIANA. Indian Tawny Eagle.

I took a clutch of two eggs from the nest of this bird in December: she did not desert but proceeded to lay again and I had the second pair of eggs, slightly smaller than the first, taken in January. I believe the bird is still using the same site.

1211. (98). SPIZAËTUS CIRRHATUS. CrestedHawk-eagle.

A beautiful bird: I have not found it nesting yet, but it is certainly resident.

1216. (99). CIRCAËTUS GALLICUS. Short-toed eagle.

I have also failed to find this eagle nesting as yet.

1220. (100). BUTASTUR TEESA. White-eyed Buzzard Eagle.

Common: nests in April. All eggs found were white unspotted. The peculiar pale yellow eye can be distinguished at a considerable distance.

1228. (101). HALIASTUR INDUS. Brahminy kite.

Sankar chil.

1229. (102). MILVUS GOVINDA. Common Pariah-kite.

Chil.

1244. (103). ASTUR BADIUS. Shikra.

Shikra.

1255. (104). FALCO PEREGRINATOR. Shahin Falcon.

Sháhín báz.

Not common, but I have seen it on various occasions and identified it beyond doubt. Have not found it nesting yet.

1257. (105). FALCO JUGGER. Laggar Falcon.

Laggar.

I took a clutch of the 4 very handsome eggs of this Falcon, fairly hard set, on 19th February 1909. It is not common in Saugor.

1264. (106). ÆSALON CHICQUERA. Turumti or Red-headed martin.

Turumti.

Also not common, and I have as yet failed to secure the eggs. I found a pair building last year but unfortunately for some unaccountable reason they deserted before completing the nest. There are, I think, one or two other species of Raptores in the district and I have had eggs brought to me, undoubtedly Hawk's, which I have been unable to identify.

1272. (107). CROCOPUS CHLOROGASTER. Southern Green Pigeon.

Harial.

1292. (108). COLUMBA INTERMEDIA. Indian Blue-rock Pigeon.

Kabutar.

1307. (109). TURTUR SURATENSIS. Spotted Dove.

Chitla Fákhta.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1309. (110). TURTUR CAMBAYENSIS. Little Brown Dove.
Fákhta.

1310. (111). TURTUR RISORIUS. Indian Ring-Dove.
Bara Fákhta.

1311. (112). ŒNOPOPELIA TRANQUEBARICA. Red Turtle Dove.
Lál Fákhta.

All these pigeons and doves are ubiquitous.

1317. (113). PTEROCLES FASCIATUS. Painted Sand Grouse.
Chapka.

The vernacular name is the same as for the Nightjar with which the natives apparently confuse this bird.

1321. (114). PTEROCLURUS EXUSTUS. Common Sand-grouse.
Bhat titar.

1324. (115). PAVO CRISTATUS. Common Pea-fowl.
Mor.

1350. (116). GALLOPERDIX LUNULATA. Painted Spur-fowl.
Jangli murghi.

I have never seen the Red Spur-fowl (*Galloperdix spadicea*) in Saugor, and do not think he exists here.

1356. (117). COTURNIX COROMANDELICA. Black breasted or Rain-quail.
Bater.

1357. (118). PERDICULA ASIATICA. Jungle Bush-quail.
Chota Bater.

1358. (119). PERDICULA ARGUNDA. Rock Bush-quail.

There are other points of distinction but for the ordinary person the main distinction between these two Bush-quails lies, as Hume points out, in the chin.

"It is difficult to represent colours accurately in words, but bright chestnut (the Jungle Bush-quail) and dull rufous, slightly suffused in many specimens with a grey shade (the Rock Bush-quail) are so different that the colouration of the chin and throat ought alone to suffice to distinguish adults, at any rate, of the two species."

1373. (120). FRANCOLINUS PICTUS. Painted partridge.
Kálá Titar.

In the Saugor Gazetteer Colonel Sutherland, I.M.S., mentions the Black Partridge (*Francolinus vulgaris*) as one of the Saugor birds. He tells me that he has undoubtedly seen this species in Saugor, but it was some years ago. I myself have never seen it, though constantly on the look-out, more especially when in camp on our North border, for the Black Partridge is certainly found in Jhansi. Mr. Thornhill however shot a Black Partridge cock by the Garoula Tank in November 1909, and the identification being beyond doubt, the Black Partridge may perhaps still be included among the Saugor resident species, though it is certainly extremely rare.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1375. (121). FRANCOLINUS PONDICERIANUS. Grey Partridge.
Gora Titar.

1382. (122). TURNIX PUGNAX. Bustard-quail.

1383. (123). TURNIX DUSSUMIERI. Little Button-quail.
Lawa.

1384. (124). TURNIX TANKI. Indian Button-quail.

Starting with the Sand-Grouse, I believe this to be a complete list of the resident game birds of Saugor. I have found the nests of all with the exception of the two Button-quails, the discovery of which seems to me a matter of pure luck and to depend on the size of one's boots (extra size policeman's should be well adapted for quail nesting) as much as on anything else, and I still live in hopes of treading on one some day.

The lesser Florican (*Sypheotis aurita*) has been seen, but extremely rarely, in Saugor, and there is certainly not enough evidence to call it a resident.

1400. (125). AMAURORNIS AKOOL. Brown Crake.

Mr. Thornhill found this Crake with young at the end of June. Oates and Blanford mention "some young birds from Saugor in the Hume collection."

1401. (126). AMAURORNIS PHŒNICURUS. White breasted water-hen.
Jal murghi.

1402. (127). GALLINULA CHLOROPUS. Moorhen.
Jal murghi.

I do not think the Coot (*Fulica atra*) breeds in Saugor.

1409. (128). GRUS ANTIGONE. Sarus.
Sáras.

The Sarus usually breeds in the rains, about August, but Mr. Thornhill found a nest two years running by the Saugor lake in March.

1418. (129). ŒDICNEMUS SCOLOPAX. Stone-curlew.

I found two eggs of this bird in August 1909. It makes no nest at all.

1419. (130). ESACUS RECURVIROSTRIS. Great Stone-Plover.

The local Vernacular name for any kind of Plover is Titirri. The great Stone Plover is known as the Billiwallah-Ánkh-Titirri or cat-eyed Plover. It makes no nest, lays its two handsomely marked eggs from March to May.

1422. (131). CURSORIUS COROMANDELICUS. Indian Courser.

1428. (132). METOPIDIUS INDICUS. Bronze winged Jacana.
Languria.

1429. (133). HYDROPHASIANUS CHIRURGUS. Pheasant-tailed Jacana.
Safed Languria.

Both Jacanas are common, but their floating nests and beautiful glossy eggs take a lot of finding.

1431. (134). SARCOGRAMMUS INDICUS. Red-wattled Lap-wing.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1432. (135). SARCIOPHORUS MALABARICUS. Yellow-wattled Lap-wing.
1447. (136). ÆGIALITIS DUBIA. Little Ringed-Plover.
1488. (137). ROSTRATULA CAPENSIS. Painted Snipe.

Rája cháh.

Quite common: I found three nests, all within 100 yards, on Saugor lake last year. The ground colour of the eggs is usually yellowish stone colour but I found one clutch distinctly greenish, covered with the usual large blotches.

1504. (138). STERNA MELANOGASTER. Black-bellied Tern.
1528. (139). PHALACROCORAX JAVANICUS. Little Cormorant.
1529. (140). PLOTUS MELANOGASTER. Indian Darter or Snake-bird.
1541. (141). IBIS MELANOCEPHALA. White Ibis.
1542. (142). INOCOTIS PAPILLOSUS. Black Ibis.
1545. (143). PLATALEA LEUCORODIA. Spoon Bill.
1552. (144). PSEUDOTANTALUS LEUCOCEPHALUS. Painted Stork.
1553. (145). ANASTOMUS OSCITANS. Open-bill.
1554. (146). ARDEA MANILLENSIS. Eastern Purple Heron.
1555. (147). ARDEA CINEREA. Common Heron.

Herons are very careless nurses: I found quite a considerable number of young birds underneath the tree occupied by one colony and had to put an end to one or two which had survived but been injured by the fall.

1561. (148). HERODIAS GARZETTA. Little Egret.
1562. (149). BUBULCUS COROMANDUS. Cattle Egret.

The Egrets, as I have already observed, seem to prefer the waters of the adjoining Damoh district for breeding purposes and I have had some happy days over there with Mr. Trench visiting various colonies. The value of the Little Egrets plumes is well known, and one colony we visited we were glad to find was under the protection of the village landlord, the birds being unmolested and the plumes only collected on their moulting. But this was not always the case, and the attention of the District Magistrate being drawn to the matter I am glad to say that all Egret colonies in Damoh are now under magisterial protection. A tree with an Egret colony looks as if it had been heavily snowed on, and to see the birds fluffing out their plumes is worth going a long way.

1565. (150). ARDEOLA GRAYI. Pond Heron.

Baglá.

'Bagla' is the local name for all birds of this shape, Herons, Egrets, even Ibises being included. The Pond Heron, or more familiarly Paddy bird, affords in Saugor an extraordinary instance of the temporary loss, during the breeding season, of all fear of human Society, its chosen nesting site being the tall trees by the Gopalganj Police Station. The Paddy-bird has evidently not heard of the Mackarness pamphlet on the Indian Police, or it would hardly choose such a dangerous neighbourhood for a nursery.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1567. (151). BUTORIDES JAVANICA. Little Green Heron.

Oates and Blanford describe this Heron as "less nocturnal than the Bitterns and may occasionally be seen fishing in the day time in shady places." So far as I have seen it, I should call it a most ordinarily diurnal bird, but this perhaps was due to the fact that it was nesting at the time.

1584. (152). SARCIDIORNIS MELANOTUS. Comb Duck.
Nakta.

1589. (153). DENDROCYCNA JAVANICA. Whistling Teal.
Chillonia.

1591. (154). NETTOPUS COROMANDELIANUS. Cotton Teal.
Bhujakiya.

The first and last of these have steadily defeated every attempt to find their nests, though that they breed here is absolutely certain. The nearest I have got to the Cotton Teal was to find a nest, in a hole in a tree, at Khurai from which the young had recently flown.

1617. (155). PODICIPES ALBIPENNIS. Indian Little Grebe or Dabchick.
Charcharia or Pandubi.

For some reason or other they do not approve of the Saugor lake as a nursery site; seen there in quantities up to July, they then one and all unobtrusively disappear to other more favoured spots.

There are one or two other water birds, rails I think more specially, which ought to be included in this list, but which I have at present failed to locate with sufficient certainty.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

XIV.

(*Continued from page 736 of Volume XX.*)

PTEROPHORIDÆ.

Deuterocopus, Z.

I think that Mr. T. Bainbrigge Fletcher in his recent paper on this genus (Trans. Ent. Soc. Lond., 1910) has not yet got to the bottom of the difficulties connected with it. The whole subject cannot be discussed here, but I consider that the two following forms are truly and recognisably distinct from *socotranus* and from each other. It will greatly assist the study of the genus if collectors, who come across a species in plenty, will take a good series of specimens at the same place and time, which can be relied on as specifically identical, and also ascertain the species of vine which they frequent.

Deuterocopus viticola, n. sp.

♂ ♀. 9-10 mm. Head and thorax ochreous-brown sprinkled with dark fuscous, face more ochreous, thorax beneath yellowish-white. Palpi whitish, second and terminal joints each with two ferruginous bands more or less sprinkled with dark fuscous. Antennæ black lined with white, ciliations in ♂ $\frac{1}{3}$. Abdomen ferruginous-ochreous more or less suffused with brown, basal segment with two white spots, second segment forming a darker brown band, its posterior margin mixed with white, behind this with two interrupted white lines, beneath yellowish-white with a usually interrupted slight ferruginous bar on margin of third segment. Legs brown more or less irrorated with dark fuscous, with indistinct rings of white irroration. Forewings with lower cleft $\frac{2}{3}$ of upper: ferruginous-brown, variably irrorated with dark fuscous; two or three white scales at base of upper cleft; the dark irroration forms a patch on base of first segment and an inwardly oblique fascia at its middle, between and beyond which the segment is suffused with fulvous-ochreous; second segment with a transverse fine median line of a few white scales: cilia bronzy-fuscous, faintly rosy-tinged, slightly mixed with white scales on basal $\frac{2}{3}$ of upper cleft and basal half of lower, beyond this with a dark fuscous patch on upper margin of second and third segments reaching apex, and on lower margin of all segments extending to apex and limited by a gently curved colinear (subcontinuous) black basal line at apex of each segment, but on two upper

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

segments cut by a single white scale near before apex, on dorsum with a blackish scale-projection just beyond cleft, at apex of wing with a blackish bar, on costa brownish-ochreous with a dark fuscous patch on middle of first segment. Hindwings dark fuscous, tinged with crimson anteriorly, and near base with ferruginous; cilia rosy-fuscous, on dorsum with a small triangular blackish scale-projection just before middle of third segment, and a large circular blackish scale-projection occupying its apex on both margins.

Hambantota and Puttalam, Ceylon (Pole, Fletcher); in October and November, eight specimens. This is the form bred in plenty by Mr. Fletcher from larvæ feeding on flowers of *Vitis quadrangularis*; it is the commonest Ceylon form (I have seen numerous specimens besides those here described), but possesses characters which I have never met with in examples from other localities. Mr. Fletcher includes it in his account of *socotranus*, but together with what I regard as heterogeneous material from various regions.

Deuterocopus alopecodes, n. sp.

♂ ♀. 10-11 mm. Head and thorax ferruginous sprinkled with dark fuscous, thorax beneath whitish-yellow. Palpi whitish, second and terminal joints each with two ferruginous bands. Antennæ black, lined and dotted with white, ciliations in ♂ $\frac{1}{2}$. Abdomen ferruginous, basal segment with two small white spots, posterior margin of second segment somewhat mixed with white, two or three pairs of white dots or slight marks on posterior segments, beneath whitish-yellow with well-marked entire deep ferruginous band on posterior margin of third segment. Legs ferruginous banded with dark fuscous suffusion on whorls, and more or less obscurely ringed with white. Forewings with lower cleft over $\frac{2}{3}$ of upper; ferruginous, variably irrorated with dark fuscous; the dark irroration forms a patch on base of first segment and a band at its middle, latter sometimes hardly marked, its margins sometimes indicated by a few white scales; two or three white scales on second segment beyond its middle: cilia golden-bronzy, slightly mixed with white scales on basal $\frac{2}{3}$ of upper cleft and basal half of lower, beyond this with a patch of dark fuscous suffusion on upper margin of second and third segments reaching apex, and on lower margin of all segments separated by a pale patch from a blackish downwards-directed triangular apical scaletooth, most distinctly on second and third segments, outer edge of apical scaleteeth nearly straight but dislocated and not in the same line, on dorsum with a slender blackish scale-projection just beyond cleft, at apex of wing with a blackish bar, on costa ferruginous-ochreous with a blackish patch on middle of first segment. Hindwings dark fuscous, third segment ferruginous; cilia golden-bronzy, sometimes rosy-tinged, on dorsum with a small triangular scaletooth of ferruginous and black scales before middle of third segment, and a large angular

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

suboblong projection of black and ferruginous scales occupying its apex on both sides, with its lower margin triangularly emarginate.

Karwar, in August (Maxwell); five specimens. Mr. Maxwell, who is at present in England, informs me that these were all taken from a single vine-plant on which the species was plentiful, and that he will be able to ascertain its name on his return.

Marasmarcha phlyctaenias, n. sp.

♂ ♀. 16-20 mm. Head ochreous-whitish, face and crown somewhat infuscated. Palpi moderately long, slender, ochreous-whitish, terminal joint with dark fuscous lateral line. Antennæ light greyish-ochreous, ciliations in ♂ $\frac{1}{4}$. Thorax ochreous-whitish finely sprinkled with fuscous. Abdomen ochreous-whitish, with indications of pale brownish-ochreous stripes. Forewings cleft from $\frac{3}{5}$, segments acute, first moderate, second narrower (but much less narrow than in *atomosa*); whitish-ochreous, tinged with fuscous except towards dorsum anteriorly, more infuscated on posterior half, sometimes with a few scattered dark fuscous scales; three more or less marked cloudy roundish discal spots of dark fuscous irroration, *viz.*, towards dorsum at $\frac{1}{4}$, towards costa at $\frac{1}{3}$, and before cleft: cilia pale whitish-ochreous, grey on outer $\frac{2}{3}$, beneath apex of each segment with an irregular blackish scale-tooth, above apex of second with a short blackish subbasal line, on lower margin of first segment with three blackish specks, on dorsum with several irregular undefined groups of black specks. Hindwings with segments slender, acute; dark grey; cilia pale ochreous-grey, on dorsum with a series of scattered black scales from base to beyond middle.

Puttalam and Trincomali, Ceylon (Pole, Fletcher); N. Coorg, 3,500 feet (Newcome); from October to December, seven specimens. Closely allied to *atomosa*, but readily distinguished by the different colour and considerably broader segments of forewings. It has however hitherto been confused with *atomosa*, and most records of that species from Ceylon are probably referable to *phlyctænias*, but I have a specimen of *atomosa* from Peradeniya.

Orneodidæ.

Orneodes panduris, n. sp.

♀. 18-20 mm. Head ochreous-white. Palpi moderately long, ascending, with appressed scales, terminal joint $\frac{2}{3}$ of second, ochreous-whitish, second joint slightly sprinkled with dark fuscous. Antennæ whitish-ochreous. Thorax whitish-ochreous. Abdomen whitish-yellow-ochreous. Forewings light ochreous-yellow, crossed by five rather curved cloudy whitish rather thick lines, second and third enclosing a moderate median fascia hardly darker than ground colour, widest on third segment; a small whitish spot on costa between third and fourth; fourth line expanded on first two segments, and sometimes confluent with fifth on costa: cilia light ochreous-yellowish, with obscure whitish bars on lines, on median fascia

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

greyish. Hindwings light ochreous-yellow, with four thick curved whitish lines, first two enclosing a moderately broad slightly darker antemedian fascia; cilia as in forewings, greyish on antemedian fascia.

Palni Hills (6,000 feet), and Gooty (Campbell); two specimens.

Orneodes lyristis, n. sp.

♂ 13 mm. Head white sprinkled with dark fuscous. Palpi moderately long, subascending, second joint thickened with dense scales angularly projecting at apex beneath, dark fuscous sprinkled with white, terminal joint ⅔ of second, rather thick, white with dark fuscous median band. Antennæ whitish-fuscous. Thorax grey sprinkled with dark fuscous and white. Abdomen with basal segment dark fuscous, marked with white on posterior margin, next four segments blackish, with margins somewhat marked with white, remainder ochreous-whitish with a few blackish scales. Forewings ochreous-whitish closely irrorated with dark fuscous; three blackish marks along costa on anterior half, terminated at each extremity by fine white strigulæ; a moderately broad nearly straight median fascia, edged with dark fuscous and then with fine white lines, slightly angulated near costa, widest on sixth segment; a subquadrate dark fuscous spot on costa beyond this, with white lateral margins which are curved round on costa so as to be continuous with preceding and following white lines; a moderate straight dark fuscous subterminal fascia, edged with fine white lines; a blackish dot at apex of each segment: cilia pale fuscous, with whitish bars on lines, on median and subterminal fasciæ dark fuscous, on space between these pale yellowish between second and third segments, and between fourth and sixth. Hindwings whitish, with scattered dots of dark fuscous irroration; basal area irrorated with dark fuscous up to a moderately broad blackish antemedian fascia edged with white, remainder of first two segments also irrorated with dark fuscous, with two white dots: cilia fuscous mixed with dark fuscous and barred with whitish, on segments 3-6 whitish on posterior half with light fuscous bars towards apex.

Khasis, in May; one specimen.

TINEIDÆ.

Nepticula polydoxa, n. sp.

♂. 3 mm. Head pale yellowish. Antennæ grey, eyecaps yellow-whitish. Thorax dark grey. Abdomen grey. Forewings lanceolate; dark shining purplish grey; a somewhat oblique bright silvery-metallic fascia at about ⅔, preceded by blackish irroration, apical area beyond this wholly suffused with blackish irroration: cilia grey mixed with blackish, outer half silvery-whitish, on tornus with a silvery-metallic patch posterior to fascia, but connected with it. Hindwings and cilia grey.

Peradeniya, Ceylon (Green); in April, one specimen. Characterised by the small size, and silvery tornal patch in cilia.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Nepticula sporadopa, n. sp.

♂. 5 mm. Head brown. Antennæ pale greyish-ochreous, eyecaps ochreous-whitish slightly speckled with dark fuscous. Thorax whitish mixed with grey and dark fuscous. Abdomen greyish. Forewings lanceolate; whitish-ochreous, sprinkled with dark fuscous, with a slight purple gloss; a small undefined spot of black irroration in disc beyond middle: cilia on basal half whitish-ochreous sprinkled with dark fuscous, outer half whitish. Hindwings and cilia pale grey.

Trincomali, Ceylon (Fletcher), in June; one specimen.

Opostega epistolaris, n. sp.

♂. 8-9 mm. Head, antennæ, and thorax white. Abdomen pale prismatic grey. Forewings lanceolate; white; a semi-oval dark fuscous spot on middle of dorsum; a minute black dot at apex: cilia pale ochreous, towards tornus whitish, on costa with two or three oblique fuscous lines at and near base from $\frac{3}{4}$ to apex. Hindwings pale grey; cilia whitish-grey.

N. Coorg, 3,500 feet, in May (Newcome); two specimens.

Crobylophora siglias, n. sp.

♀. 8 mm. Head, thorax, and abdomen white, occipital tuft small. Antennæ whitish, eyecap white. Forewings lanceolate, apex caudulate; shining white; three dark fuscous strigulæ from posterior half of costa, faintly edged posteriorly with pale yellowish; a round raised bronzy-leaden-metallic spot on tornus, marked anteriorly with a small black dot, and surrounded by some pale ochreous-yellowish suffusion: cilia white, on costa ochreous-whitish with an oblique dark fuscous subbasal line terminating at apex and a shorter fuscous line above this towards apex, on termen with a patch of light ochreous-yellow suffusion. Hindwings and cilia white.

Khasis, in April; one specimen.

Leucoptera sphenograpta, n. sp.

♂ ♀. 6-7 mm. Head, thorax, and abdomen white. Antennæ grey, basal joint white. Forewings lanceolate, apex caudulate; shining white; an oblique dark grey strigula from middle of costa terminating in an oblique elongate light ochreous-yellow anteriorly grey-edged spot which extends from near costa to disc at $\frac{3}{4}$; a light ochreous-yellow triangular spot on costa at $\frac{3}{4}$, preceded by a dark grey oblique strigula; a light ochreous-yellow patch extending along termen; a round black apical dot: cilia white, on costa with two short direct grey bars, round apex whitish-ochreous beyond a short blackish subbasal line, with two diverging grey bars, on termen yellowish at base within a fine subbasal line of grey irroration. Hindwings and cilia white.

Mooltan (Manders), Pusa (Lefroy), in April and May; seven specimens. Bred from larvæ mining blotches in leaves of *Dalbergia sissu* (Lefroy).

Lyonetia melanochalca, n. sp.

♂ ♀. 8-11 mm. Head silvery-white, crown silvery-grey, apparently

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

without tuft. Palpi moderately long, white. Antennæ whitish. Thorax silvery-grey. Abdomen whitish. Forewings very narrow, elongate-lanceolate, acutely pointed, caudulate; pale ochreous-yellowish; a coppery-bronze patch occupying basal $\frac{2}{3}$ of wing, longitudinally streaked with blackish suffusion in disc, brassy-metallic towards dorsum and posterior edge, which is inwardly oblique from costa; an inwardly oblique brassy-metallic fascia beyond middle, marked with two black longitudinal dashes, and terminating above in a black subcostal line which runs to near apex; a brassy-metallic streak along termen, edged above with a black line except near apex; a black apical spot: cilia grey, at apex with a blackish hook-projection and another less marked beneath it, on costa wholly white. Hindwings rather dark grey; cilia grey.

Khasis, in October; two specimens.

Lyonetia praefulva, n. sp.

♂ ♀. 8-11 mm. Head, palpi and thorax white, occipital tuft moderate. Antennæ dark grey, eyecap white. Abdomen grey. Forewings very narrow, elongate-lanceolate, acutely pointed, caudulate; shining white; a ferruginous-brown apical blotch, its anterior edge strongly convex, margined by a suffused dark fuscous streak running from costa beyond middle to tornus, where it is sometimes enlarged into a triangular spot; a round black apical dot mostly in cilia: cilia grey, on costa with three dark fuscous bars preceded by spots of whitish suffusion, at apex with projecting blackish bar and an oblique one below it, on termen with a blackish subbasal line. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon (Pole); Khasis; from March to June, and from October to December, eight specimens.

Prytaneutis, n. g.

Head smooth; tongue absent. Antennæ $\frac{4}{5}$, in ♂ simple, basal joint dilated with scales so as to form a moderate eyecap. Labial palpi short, drooping, filiform, pointed. Maxillary palpi rudimentary. Posterior tibiæ clothed with very long fine hairs above. Forewings with 3 absent, 4 absent, 6 and 7 stalked, 7 to costa, 10 absent, 11 from before middle. Hindwings under $\frac{1}{2}$, linear, cilia 6; transverse vein absent between 2 and 5, 3 absent, 4 absent, 5-7 approximated at base.

Allied to *Lyonetia*, which however has the antennæ always longer than forewings.

Prytaneutis clavigera, n. sp.

♂ ♀. 8-11 mm. Head and palpi white. Antennæ grey, basal joint white. Thorax whitish-grey, in ♂ with an expansible tuft of long fine hairs from beneath hindwings. Hairs of posterior tibiæ whitish-ochreous. Forewings elongate-lanceolate, apex caudate, rather upturned; pale glossy purplish-grey; costal edge white from base to an oblique white strigula at $\frac{2}{3}$, reaching half across wing; a longitudinal orange-yellow mark in disc beneath this

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

strigula; apical area beyond this dark yellowish-grey, marked with two converging white wedge-shaped costal strigulæ; a round black apical dot, edged on costa with white: cilia lilac-grey, on costa whitish barred with dark grey, at apex with two diverging blackish hooks, beneath apex suffused with whitish within a blackish sub basal line. Hindwings grey; cilia yellowish-grey-whitish.

Maskeliya, Ceylon (Pole); in January and April, three specimens.

Opogona orchestris, n. sp.

♂. 11 mm. Crown dark purple-fuscous, fillet, face, and antennæ ochreous-whitish. Palpi ochreous-whitish, externally with a streak of fuscous suffusion on upper part of second joint, and terminal joint except apex. Thorax dark purple-fuscous. Abdomen grey, anal tuft whitish-ochreous. Posterior tarsi with whorls of bristles at apex of joints. Forewings elongate-lanceolate, apex acutely produced; bright brassy-yellow; a dark purple-fuscous basal patch, occupying about $\frac{1}{6}$ of wing, edge somewhat angulated below middle; an irregularly triangular dark purple-fuscous blotch extending on dorsum from origin of cilia to middle of termen, and reaching costa at $\frac{3}{4}$, its anterior edge very oblique, somewhat indented in middle and convex near dorsum: cilia grey, becoming pale yellowish on costa. Hind wings rather dark grey; cilia grey.

Hakgala, Ceylon, in April (Green); one specimen.

Opogona dramatica, n. sp.

♀. 10 mm. Head and thorax rather dark bronzy-fuscous, face and antennæ ochreous-whitish. Palpi ochreous-whitish, externally with a dark fuscous streak. Abdomen rather dark fuscous, on sides and beneath pale ochreous. Forewings elongate-lanceolate, apex acute; clear light yellow; a dark purple-fuscous streak along costa from base to $\frac{1}{3}$; posterior half dark purple-fuscous, its anterior edge vertical, with short triangular projections in and above middle, enclosing a small triangular spot of ground-colour on costa at $\frac{3}{4}$; cilia fuscous. Hindwings rather dark fuscous; cilia fuscous.

Khasis, in August; one specimen.

Opogona semisulphurea, Stt.

This species must apparently be regarded at present as distinct from the Javanese *dimidiatella* Z., which is only known from the original example the latter differs however only in the somewhat inward inclination of the median dividing line, and the distinction may ultimately prove not to be tenable.

Puttalam, Ceylon; Calcutta; Khasis; Kuching, Borneo; twelve specimens.

Opogona stathmota, n. sp.

♂ ♀. 11-16 mm. Head dark fuscous, face ochreous-whitish. Palpi ochreous-whitish, externally with a streak of dark fuscous suffusion. Antennæ ochreous-whitish, basal joint dark fuscous. Thorax dark fuscous, posterior third yellow. Abdomen fuscous. Hairs of posterior tibiæ pale

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

grey. Forewings elongate-lanceolate, apex acute, somewhat produced; yellow; a small triangular dark fuscous spot on base of costa, extending less than $\frac{1}{8}$ of wing; posterior half fuscous with slight purple gloss, its anterior edge rather outwardly oblique from costa, marked with a few black scales, with two or three slight irregular indentations: cilia fuscous. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon (Pole, Alston, de Mowbray); N. Coorg, 3,500 feet (Newcome); from March to May, and August to October, eight specimens. In *semisulphurea* the division of colour is nearly vertical, and the basal mark of costa forms a streak extending about $\frac{1}{5}$ of wing; in *isoclina* the division is much more oblique, and the hairs of posterior tibiæ are ochreous-whitish.

Opogona xanthocrita, n. sp.

♀. 14-15 mm. Head dark purple-fuscous, face ochreous-whitish. Palpi ochreous-whitish, externally with streak of dark fuscous suffusion. Antennæ ochreous-whitish, basal joint dark fuscous. Thorax yellow, anterior third dark purple-fuscous. Abdomen greyish. Hairs of posterior tibiæ pale whitish-ochreous tinged with grey. Forewings elongate-lanceolate, apex somewhat produced, acute; clear yellow; a wedge-shaped dark purple-fuscous mark on base of costa, extending hardly $\frac{1}{6}$ of wing; somewhat more than posterior half rather dark fuscous, with slight purplish gloss, anterior edge vertical, slightly irregular, marked with a few blackish scales: cilia fuscous. Hindwings grey; cilia pale greyish.

Nilgiris, 3,500 feet (Andrewes); N. Coorg, 3,500 feet (Newcome); from August to November, five specimens. Intermediate between *semisulphurea* and *stathmota* in wing-markings, but differs from both in having the thorax mainly yellow.

Opogona pandora, n. sp.

♂ ♀. 13-14 mm. Head rather dark purplish-fuscous, face ochreous-whitish. Palpi ochreous-whitish, externally suffused with dark fuscous. Antennæ ochreous-whitish, basal joint rather dark fuscous above. Thorax dark purplish-fuscous, posterior third pale yellow. Abdomen grey. Forewings elongate-lanceolate, apex produced, acute; rather dark purplish-fuscous; a light yellow oblong blotch extending along dorsum from base to near middle of wing, and reaching $\frac{2}{3}$ or more across wing, posterior edge rather irregular: cilia fuscous. Hindwings rather dark grey; cilia grey.

Khasis, in October; two specimens.

Opogona sphaerotoma, n. sp.

♀. 10 mm. Head and thorax dark purplish-fuscous, fillet brassy-metallic, face ochreous-whitish. Palpi ochreous-whitish, terminal joint externally infuscated towards base. Antennæ ochreous-whitish, basal joint infuscated. Abdomen grey. Forewings elongate-lanceolate, apex somewhat produced, acute; dark purplish-fuscous; a bright yellow semi-circular

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

blotch extending on dorsum from $\frac{1}{4}$ of wing to beyond middle, and reaching more than half across wing: cilia bronzy-fuscous. Hindwings dark grey; cilia grey.

N. Coorg, 3,500 feet, in September (Newcome); one specimen.

Opogona cerodelta, n. sp.

♂ ♀. 11-15 mm. Head and thorax dark purplish-fuscous, face pale whitish-ochreous. Palpi ochreous-whitish, externally suffused with dark fuscous. Antennæ fuscous. Abdomen dark bronzy-fuscous. Forewings elongate-lanceolate, apex produced, acute; dark purplish-fuscous; a moderate sharply-defined triangular ochreous-whitish spot on dorsum somewhat before middle of wing, reaching $\frac{1}{3}$ across wing: cilia rather dark fuscous. Hindwings dark fuscous, in ♂ coppery-tinged; cilia rather dark fuscous.

Sikkim, 4,500 feet (Dudgeon); Khasis; in May, July, and October, five specimens.

Opogona plasturga, n. sp.

♂ ♀. 10-12 mm. Head and thorax dark purplish-fuscous, face ochreous-whitish, fillet brassy-metallic. Palpi ochreous-whitish, externally with a suffused fuscous streak. Antennæ rather dark fuscous. Abdomen dark fuscous. Forewings elongate-lanceolate, acute; dark purplish-fuscous: a transverse or sub-triangular whitish-ochreous spot on dorsum somewhat before middle of wing, anteriorly suffused, posteriorly well-defined, reaching more than half across wing: cilia rather dark fuscous. Hindwings dark bronzy-fuscous; cilia rather dark fuscous.

Nilgiris, 3,500 feet, in August (Andrewes); two specimens.

Opogona elaitis, n. sp.

♂. 10-11 mm. Head dark purplish-fuscous, face whitish, fillet silvery-metallic. Palpi whitish, externally with a dark fuscous streak. Antennæ fuscous-whitish, basal joint dark fuscous towards apex. Thorax rather light ochreous-grey. Abdomen grey. Forewings elongate-lanceolate, apex produced, acute; yellowish-grey, with a faint lilac gloss: cilia concolorous. Hindwings grey; cilia light grey.

N. Coorg, 3,500 feet (Newcome); from November to February, three specimens.

Opogona protographa, n. sp.

♂ ♀. 11-14 mm. Head, antennæ and thorax whitish-bronzy-ochreous. Palpi ochreous-whitish, externally with a dark fuscous streak. Abdomen greyish. Forewings elongate-lanceolate, apex slenderly long-produced, acute; pale bronzy-ochreous; costal edge suffused with dark fuscous towards base; a blackish discal dot at $\frac{2}{5}$, and one on dorsum slightly beyond this, sometimes also a third beneath costa in a line with these; posterior area beyond these sometimes tinged with fuscous, or more or less suffused with fuscous towards termen and apex: cilia pale bronzy-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

yellowish, base sometimes tinged with fuscous. Hindwings grey; cilia pale greyish-yellowish.

Khasis, in September and October; fourteen specimens.

Amathyntis, Meyr.

This genus does not appear to have any close relationship with *Opogona* as originally stated, but is essentially a smooth-headed *Tinea*.

Amathyntis catharopa, n. sp.

♂. 12-14 mm. Head and thorax bronzy-yellowish, face silvery-white. Palpi whitish, second joint with a slight lateral line of blackish scales. Antennæ light greyish-ochreous. Abdomen whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex acute, termen extremely obliquely rounded; bronzy-yellowish: cilia light yellow. Hindwings more acutely pointed than in the other species; grey; cilia yellow-whitish.

Maskeliya, Ceylon (Pole); in October and January, two specimens.

Amathyntis oporina, n. sp.

♂ ♀. 12-17 mm. Head and thorax bronzy-yellowish, forehead and face shining whitish. Palpi dark grey, terminal joint white. Antennæ grey, basal joint white. Abdomen light greyish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex pointed, termen extremely obliquely rounded; shining ochreous-yellow; cilia concolorous. Hindwings grey; cilia whitish-ochreous.

Khasis, from June to October; six specimens.

Amathyntis athyra, n. sp.

♂. 15 mm. Head and thorax bronzy-whitish-ochreous. Palpi dark fuscous, terminal joint whitish. Antennæ whitish-ochreous tinged with grey. Abdomen ochreous-grey-whitish. Forewings elongate, rather narrow, costa moderately arched, apex pointed, termen extremely obliquely rounded; light bronzy-ochreous-yellowish; costal edge suffused with dark fuscous from base to $\frac{2}{3}$; a few scattered dark fuscous scales towards apex: cilia light yellow, towards base with a few dark fuscous specks. Hindwings grey; cilia whitish-ochreous.

Maskeliya, Ceylon, in February (Pole): one specimen.

Amathyntis nucleolata, n. sp.

♂. 12-14 mm. Head, antennæ, thorax, and abdomen glossy whitish-ochreous. Palpi dark fuscous, terminal joint ochreous-whitish. Forewings elongate, rather narrow, costa gently arched, apex pointed, termen extremely obliquely rounded; glossy whitish-ochreous, posteriorly with some scattered dark fuscous scales; costal edge dark fuscous towards base; a rather large cloudy dark fuscous dot in disc at $\frac{2}{3}$: cilia whitish-ochreous, somewhat sprinkled with dark fuscous specks. Hindwings whitish-grey; cilia pale whitish-ochreous.

Maskeliya, Ceylon (Pole); in May, November, and January, three specimens.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Epactris, Meyr.

It should have been mentioned in the characters of this genus that the stout antennæ are distinctly flattened.

Epactris thyreota n. sp.

♂. 8-9 mm. Head and palpi blackish. Antennæ ochreous-whitish. Thorax blackish-fuscous, patagia whitish-ochreous except shoulders. Abdomen grey. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded; whitish-ochreous, markings blackish-fuscous; a large triangular patch extending along costa from base to $\frac{4}{5}$, broadest posteriorly, where it reaches $\frac{2}{3}$ across wing, but including a roundish spot of ground-colour in disc beyond middle, of which the dark lower edge is suffused or sometimes almost obsolete; apex of this patch connected with an irregular streak along termen; a slender streak along dorsum from base to near middle: cilia whitish-ochreous, towards base with undefined bars of dark fuscous suffusion. Hindwings grey; cilia pale grey.

Madulsima and Bandarawela, Ceylon (Pole, Vaughan, Fletcher); in April and May, four specimens. Nearly allied to *melanchæta* (of which I have now a good series), but much smaller and readily distinguished by the dark colour forming a broad unbroken costal band, whereas in *melanchæta* it is interrupted and spotted.

Monopis viatica, n. sp.

♂. 12 mm. Head whitish-ochreous. Palpi dark fuscous, apex whitish. Antennæ dark fuscous. Thorax pale reddish-ochreous, patagia blackish-fuscous. Abdomen fuscous, beneath whitish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; 2 out of 4, 6 to apex, 7 and 8 stalked; dark lilac-fuscous irregularly mixed with blackish; a roundish semi-hyaline whitish spot in disc before middle; a rather broad ferruginous-ochreous streak from base along dorsum and termen to apex: cilia pale ferruginous-ochreous, on costa dark fuscous. Hindwings with 6 and 7 stalked, 6 to apex; grey; cilia light grey.

Khasis, in May; one specimen.

Monopis florilega, n. sp.

♂. 11-12 mm. Head yellow. Palpi and antennæ dark fuscous. Thorax yellow, patagia dark fuscous. Abdomen grey. Forewings elongate, costa moderately arched, apex obtuse, termen obliquely rounded; 9 and 10 short-stalked; dark purple-fuscous irregularly mixed with blackish; a bright yellow streak along dorsum from base to tornus, upper edge rather prominent at $\frac{1}{3}$, and forming a triangular projection upwards before tornus, opposite which is a large irregular yellow costal spot reaching half across wing, marked with two or three small blackish strigulæ on costa; an obscure whitish semi-hyaline spot in middle of disc; several minute whitish dots on costa posteriorly: cilia bright yellow, on costa dark fuscous, on

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lower half of termen with basal third blackish. Hindwings with veins all separate; brassy-grey; cilia grey-whitish.

Matale and Madulsima, Ceylon (Pole, Fletcher); in May and August, three specimens.

Crypsithyris spectatrix, n. sp.

♂ ♀. 11-13 mm. Head light ochreous. Palpi dark fuscous, apex whitish. Antennæ dark fuscous. Thorax rather dark bronzy-fuscous. Abdomen light fuscous. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; 7 and 8 stalked; dark bronzy-fuscous, somewhat paler-sprinkled in disc; a distinct whitish semi-hyaline oval longitudinal spot in disc before middle, formed of two adjacent circular impressions: cilia bronzy-fuscous, paler towards tips. Hindwings light bronzy-grey; cilia bronzy-whitish.

N. Coorg, 3,500 feet (Newcome); Nilgiris, 3,500 feet (Andrewes); in May and June, three specimens.

Crypsithyris soporata, n. sp.

♂ ♀. 11-13 mm. Head light brownish. Palpi dark fuscous, apex ochreous-whitish. Antennæ rather dark fuscous. Thorax brownish mixed with dark fuscous. Abdomen pale greyish. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen extremely obliquely rounded; 7 and 8 stalked; pale ochreous-brownish, coarsely irrorated with dark fuscous; a small obscure semi-hyaline ochreous-whitish spot in middle of disc, sometimes followed by a cloudy spot of darker suffusion; slight indications of a lighter and more ochreous streak along dorsum, tending to be edged above with a dash of dark fuscous suffusion before discal semi-hyaline spot: cilia light brownish-ochreous sprinkled with dark fuscous. Hindwings rather light grey; cilia pale greyish-ochreous.

Maskeliya and Madulsima, Ceylon (Pole, deMowbray, Fletcher); in January, February and May, twelve specimens.

An obscure insect, most like *fissella*, but longer-winged, with hyaline spot much less developed and more inconspicuous, and without the dark fuscous suffused spot immediately beneath it.

Tinea schoenoploca, n. sp.

♂. 9 mm. Head white. Palpi white, with a black line above. Antennæ grey. Thorax ochreous-whitish, anterior margin suffused with blackish. Abdomen pale grey. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen faintly sinuate, extremely oblique; yellowish-white; markings blackish; a very oblique wedge-shaped patch extending over basal fourth of costa, its apex reaching in disc to near middle; about fifteen variable oblique lines from costa, reaching half across wing, mostly approximated in three groups before middle and at $\frac{2}{3}$ and $\frac{5}{6}$ respectively, their apices received by an irregular discal streak running to apex; an irregular oblique triangular patch from dorsum,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

extending over its basal third, and another beyond middle, not reaching half across wing; a slender streak along termen: cilia whitish mixed with blackish (imperfect). Hindwings grey; cilia light grey.

N. Coorg, 3,500 feet, in September (Newcome); one specimen.

Tinea isoplaca, n. sp.

♂. 8 mm. Head whitish, crown suffused with blackish on sides. Palpi white. Antennæ ochreous-whitish. Thorax dark fuscous. Abdomen grey, anal tuft grey-whitish. Forewings elongate, costa moderately arched, apex round-pointed, termen faintly sinuate, extremely oblique; dark purplish-fuscous; a broad pale yellow transverse fascia about $\frac{1}{4}$; large opposite subcostal and dorsal pale yellow spots beyond middle; seven oblique wedge-shaped whitish strigulæ from posterior half of costa, first running into subcostal spot: cilia dark fuscous, beneath tornus yellow-whitish, at apex and on costa yellow-whitish, with a projecting apical dark fuscous bar, and barred on costa with dark fuscous. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon, in May (Pole); one specimen.

Tinea hierographa, n. sp.

♂ ♀. 11-13 mm. Head dark fuscous, forehead and back of crown pale yellowish. Palpi dark fuscous, internally white. Antennæ ochreous-grey-whitish, basal joint dark fuscous, ciliations in ♂ 1. Thorax blackish, with broad posterior transverse yellow band. Abdomen dark fuscous, anal tuft in ♂ mixed with white. Forewings elongate, costa moderately arched, apex tolerably pointed, termen extremely obliquely rounded; purple-blackish-fuscous; a small yellow dorsal spot near base; a rather irregular transverse yellow fascia at $\frac{1}{4}$, connected in middle with base by an irregular sometimes interrupted yellow line; seven oblique yellow strigulæ from costa between $\frac{1}{3}$ and apex, last two enlarged into wedge-shaped spots; a yellow dot on termen beneath apex: cilia dark fuscous, with yellow spots on markings. Hindwings and cilia in ♂ rather dark grey, in ♀ dark fuscous.

Maskeliya, Ceylon (Pole); in September and October, four specimens.

Tinea imbricata, n. sp.

♂. 10-11 mm. Head fuscous, suffused with dark fuscous behind antennæ, face whitish. Palpi whitish, second joint marked with dark fuscous towards apex. Antennæ ochreous-grey-whitish, basal joint dark fuscous. Thorax pale yellow, anterior margin suffused with blackish (imperfect). Abdomen dark grey. Forewings elongate, costa moderately arched, apex obtuse, termen very obliquely rounded; dark fuscous, becoming deep bronzy towards costa; an irregular-edged light yellow patch occupying basal $\frac{2}{3}$, enclosing eight small blackish spots, *viz.*, three basal, one on costa near base, and a curved transverse series of four at $\frac{1}{4}$; seven oblique wedge-shaped white costal streaks between this and apex; a small white

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

triangular spot on dorsum before tornus: cilia dark fuscous, at apex with a white patch divided into two triangular segments by a blackish hook, on costa white with dark fuscous bars. Hindwings dark grey; cilia grey.

Maskeliya and Patipola, Ceylon (de Mowbray, Alston, Pole): in September and January, three specimens.

Tinea trierodes, n. sp.

♂. 14 mm. Head whitish, crown suffusedly mixed with dark fuscous. Palpi white. Antennæ whitish, infuscated. Thorax yellow-whitish, anteriorly suffused with fuscous. Abdomen greyish. Forewings elongate, costa moderately arched, apex tolerably pointed, termen slightly rounded, extremely oblique; dark purplish-fuscous, towards costa ochreous-bronzy; markings shining whitish suffused with light ochreous-yellowish; a patch occupying basal $\frac{2}{5}$ of wing, containing two or three small dark fuscous spots, and marked on costa with indistinct oblique streaks of ground colour; seven oblique wedge-shaped streaks from costa between this and apex; an irregular blotch on dorsum before tornus, reaching half across wing, cilia fuscous, base obscurely dotted with whitish on termen, on costa bronzy-ochreous barred with whitish. Hindwings grey, darker posteriorly; cilia grey tinged with whitish.

Palni Hills (Campbell); one specimen.

Tinea brachychlora, Meyr.

In the published description of this species the basal patch is stated (by an error of printer) to occupy $\frac{3}{5}$ of wing; it should be $\frac{2}{5}$. The species is very like *camarota*, but the ground-colour of forewings is dark fuscous, markings pale yellow, subcostal projection of basal patch much less prominent.

Maskeliya, Patipola, and Hakgala, Ceylon; five specimens.

Tinea scenatica, n. sp.

♀. 10 mm. Head fuscous, face white. Palpi white, second joint sprinkled with dark fuscous externally. Antennæ ochreous-whitish. Thorax yellow-whitish, anteriorly suffused with dark fuscous. Abdomen grey-whitish. Forewings elongate, costa moderately arched, apex tolerably pointed, termen very obliquely rounded; dark fuscous, becoming deep bronzy towards costa; a white antemedian fascia with an angular subcostal projection posteriorly, basal area as far as this fascia pale yellow; six oblique white costal strigulæ between this and apex; a rather irregular white line along termen: cilia white, beneath tornus dark fuscous, at apex with two diverging dark fuscous bars, on costa barred with dark fuscous. Hindwings light grey; cilia whitish-grey.

Maskeliya, Ceylon, in January (Pole); one specimen. Nearest to *brachychlora*, but much smaller, and without the large tornal patch.

Tinea camarota, n. sp.

♂ ♀ 12-15 mm. Head and palpi dark brown. Antennæ whitish.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

grey-ochreous. Thorax white, anterior margin dark brown, abdomen grey-whitish. Forewings elongate, costa moderately arched, apex tolerably pointed, termen very obliquely rounded; ochreous-bronze, mostly suffused with dark fuscous except towards costa; a shining white patch occupying basal of wing, with an acute-triangular subcostal projection extending to beyond middle, sometimes enclosing a very small dark fuscous spot on dorsum at $\frac{1}{4}$; six oblique white wedge-shaped strigulæ from costa between this and apex; an irregular white streak along termen, dilated on tornus into a rounded-triangular blotch: cilia white, at apex with two diverging blackish bars. Hindwings grey-whitish; cilia white.

Maskeliya and Patipola, Ceylon (Pole, Alston, Green); in April, August and September, seven specimens.

Tinea strophiota, n. sp.

♀. 18 mm. Head pale ochreous-yellowish. Palpi and antennæ whitish-ochreous, antennæ gradually infuscated towards tips. Thorax pale ochreous-yellowish, anteriorly irrorated with dark fuscous. Abdomen whitish-ochreous. Forewings elongate, costa moderately arched, apex tolerably pointed, termen very obliquely rounded; ochreous-brown; costal edge dark fuscous towards base; a very broad inwardly oblique white antemedian fascia, edged with dark fuscous irroration, posterior edge rather irregular, running from middle of costa to middle of dorsum; a small triangular white spot before tornus; a white dot on costa just before apex: cilia ochreous-brown sprinkled with dark fuscous, above apex with a light ochreous-yellowish patch. Hindwings with 5 and 6 stalked; grey; cilia pale ochreous.

Nilgiris, 3,500 feet, in May (Andrewes); one specimen.

Tinea charmatica, n. sp.

♂. 18 mm. Head yellowish-white. Palpi white, second joint with a lateral streak of dark fuscous irroration. Antennæ whitish-ochreous. Thorax white, dorsally yellowish-tinged, shoulders with a fuscous spot. Abdomen whitish-ochreous. Forewings elongate, costa gently arched, apex obtuse, termen very obliquely rounded; ochreous-yellow, sprinkled with fuscous; markings white, partially edged with a few dark fuscous scales; a broad anterior transverse fascia, inner edge near base, straight, outer edge running from middle of costa to middle of dorsum, with very acute angular projection beneath costa; four small oblique wedge-shaped spots on costa between this and apex; a large triangular spot on dorsum before tornus; a triangular blotch resting on apex and upper $\frac{2}{3}$ of termen: cilia pale yellowish. Hindwings bronzy-grey; cilia whitish-ochreous.

Palni Hills, 6,000 feet (Campbell); one specimen.

Tinea sindonia, n. sp.

♂ ♀. 20-24 mm. Head ochreous-whitish. Thorax white, anteriorly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ochreous-whitish, shoulders with a dark fuscous spot. Palpi ochreous-whitish, second joint externally dark fuscous except apex, terminal joint long, sometimes dark fuscous towards base. Antennæ ochreous-whitish, tinged with grey towards apex. Abdomen ochreous-grey-whitish. Fore-wings elongate, costa moderately arched, apex tolerably pointed, termen very obliquely rounded; pale whitish-ochreous, yellowish-tinged, in one specimen suffused with fuscous except towards base; markings white, sometimes yellowish-tinged, edged with scattered dark fuscous scales; two triangular blotches occupying most of dorsum, reaching nearly half across wing; undefined patches towards costa before middle, and in disc at $\frac{2}{3}$, sometimes almost obsolete; a semicircular spot on costa before apex, and two or three irregular spots on termen, more or less edged with dark fuscous suffusion: cilia pale whitish-ochreous sometimes mixed with fuscous, at apex with a dark fuscous bar. Hindwings with 5 and 6 stalked; pale brassy-whitish-yellowish; cilia yellow-whitish.

Palni Hills, 6,000 feet (Campbell); five specimens.

Tinea chelyodes, n. sp.

♀. 16 mm. Head and thorax pale ochreous, shoulders infuscated. Palpi whitish-ochreous. Antennæ whitish-ochreous, towards apex with several rings of dark fuscous suffusion. Abdomen whitish-ochreous. Fore-wings elongate, costa gently arched, apex pointed, termen extremely obliquely rounded; bronzy-yellow-ochreous; costa suffused with dark fuscous near base; two transverse white streaks towards base, confluent towards costa into a patch containing three costal dots of groundcolour, with a white dorsal dot between them: between this and apex are about eight indistinct transverse whitish streaks, posteriorly obsolete towards costa, and several dots on costa and termen towards apex; a blackish-fuscous elongate patch extending along dorsum from $\frac{2}{3}$ to beyond tornus, cut by one streak anteriorly and enclosing several whitish dorsal dots: cilia pale whitish-ochreous, obliquely barred with dark fuscous irroration, at apex with a direct projecting blackish bar, on costa whitish transversely barred with yellow-ochreous. Hindwings grey-whitish; cilia pale whitish-ochreous.

Khasis, in October; one specimen.

Tinea artificiosa, n. sp.

♂. 12 mm. Head and thorax white, shoulders marked with dark fuscous. Palpi and antennæ fuscous-whitish. Abdomen pale grey. Fore-wings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; shining bronzy-ochreous tinged with fuscous; markings shining white; a basal patch occupying rather more than $\frac{1}{3}$ of wing, outer edge angulated in disc, enclosing dark fuscous marks on base of costa and dorsum, and a striga of groundcolour mixed with dark fuscous from dorsum at $\frac{1}{3}$, reaching half across wing; a spot on dorsum close beyond this, and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

two smaller adjacent spots on fold and dorsum respectively; seven oblique wedgeshaped costal marks between this and apex; a subtriangular spot on dorsum before tornus, edged with dark fuscous and surmounted by a curved streak; a longitudinal streak in disc above this, followed by an undefined longitudinal patch of dark fuscous irroration: cilia bronzy-whitish, at apex with two diverging dark fuscous bars, on costa barred with dark fuscous, on termen with a dark fuscous subbasal line. Hindwings light grey: cilia whitish.

Patipola, Ceylon, in September (Alston); one specimen.

Tinea melanochrysa, n. sp.

♂. 11-14 mm. Head, palpi, antennæ, and thorax blackish. Abdomen dark fuscous. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; shining ochreous-yellow; markings brown more or less suffused with dark fuscous; a broad irregular streak along costa, dilated in middle where it reaches half across wing, on apical fourth often variably reduced in width and enclosing a white marginal striga which is sometimes once or twice interrupted; a rather broad streak from dorsum beyond middle along termen to apex, sometimes extending to base, somewhat whitish-sprinkled, above tornus rather triangularly prominent, in one specimen broadly confluent here with projection of costal streak: cilia yellow, on costa and round apex with a strong dark fuscous basal line, at apex with a dark fuscous bar. Hindwings and cilia dark grey.

Khasis, in May and June; eight specimens.

Tinea canicoma, n. sp.

♂ ♀. 14-17 mm. Head white, face, palpi, and antennæ blackish. Thorax light yellow or yellow-whitish, shoulders narrowly blackish. Abdomen grey. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen extremely obliquely rounded; light bronzy-ochreous-yellow, sometimes suffused with white on margins of dark markings; a broad dark fuscous costal streak from base to $\frac{3}{4}$, widest in middle of wing; beyond this a white striga along costa to apex, partially edged anteriorly with blackish; a dark fuscous streak from base along dorsum to origin of cilia, thence continued as a broader brown or deeper yellow streak edged with blackish to apex, on tornus somewhat sprinkled with dark fuscous and projecting upwards: cilia ochreous-yellow, round costa and apex with strong dark fuscous basal and less pronounced postmedian line. Hindwings and cilia rather dark grey.

Khasis, in June, September, and October; six specimens. Very like *melanochrysa*, but immediately distinguished by the different colour of head and thorax.

Tinea sartoria, n. sp.

♂. 13 mm. Head, palpi, antennæ, and thorax blackish, posterior

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

margin of thorax slenderly white. Abdomen dark grey. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen extremely obliquely rounded; pale ochreous-yellow; a broad dark fuscous streak along costa from base, finely white-edged beneath, broadest in middle of wing, terminated by a fine oblique white strigula about $\frac{2}{3}$, beyond this is a narrower blackish-fuscous costal streak to near apex, cut by a second fine white oblique strigula, and followed by two small white dots before apex, these markings margined beneath by a light ochreous-brown streak; a brown streak edged with black from near base along dorsum and termen to apex, on terminal edge marked with a slender white striga edged with blackish: cilia ochreous-yellowish, on costa with basal and postmedian dark fuscous lines, at apex with broad dark fuscous bar. Hindwings and cilia dark grey.

Khasis, in March; one specimen.

Tinea melliflua, n. sp.

♂. 13-16 mm. Head and thorax pale ochreous-yellow, face, shoulders, and palpi dark fuscous. Antennæ dark grey. Abdomen grey. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded: light yellow; a suffused grey streak along costa from base to $\frac{3}{4}$, where it is replaced by an orange streak edged anteriorly on both margins with grey and marked with a white oblique strigula edged anteriorly with dark grey; this costal streak is sometimes tinged with orange suffusion beneath, and a small blackish-grey spot adjoins it in middle; a narrow dark grey streak along dorsum from $\frac{1}{4}$ to origin of cilia, thence continued as an irregular subterminal streak to a small apical spot of blackish irroration, with white adjacent dots above and beneath: cilia light yellow, on costa with fuscous subbasal line. Hindwings grey; cilia grey-whitish.

Maskeliya, Ceylon (Pole); in September and October, three specimens.

Tinea zalocoma, n. sp.

♂ ♀. 11-13 mm. Head ochreous-whitish. Palpi dark fuscous, tip whitish. Antennæ grey. Thorax ochreous-whitish, shoulders dark fuscous. Abdomen grey, anal tuft whitish. Forewings elongate, rather narrow, long-pointed, acute; light grey mixed with white and pale ochreous-yellowish; costa irregularly strigulated or irrorated with blackish; markings formed of blackish irroration mixed with pale ochreous-yellowish suffusion; roundish spots beneath costa at $\frac{1}{6}$ and before middle, and smaller dorsal spots opposite these; a larger subtriangular spot on costa at $\frac{3}{4}$, its apex nearly reaching a small tornal spot; an undefined apical spot: cilia whitish-yellowish mixed with whitish. Hindwings lanceolate, grey; cilia light grey.

Maskeliya, Ceylon (Pole); in February, four specimens.

Tinea spharagistis, n. sp.

♀. 14 mm. Head pale whitish-ochreous. Palpi blackish, terminal joint

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ochreous-whitish except base. Antennæ over 1, dark fuscous. Thorax brown mixed with dark fuscous. Abdomen grey. Forewings narrow, long-pointed, acute; 7 and 8 stalked; grey mixed with whitish and sprinkled with dark fuscous, margins suffused with dark fuscous; four roundish spots of blackish-fuscous suffusion, *viz.*, one on fold at $\frac{1}{3}$, two in disc at $\frac{2}{3}$ and $\frac{3}{4}$, and one on dorsum between these two; an elongate blackish-fuscous patch along termen: cilia pale grey, towards base sprinkled with dark fuscous. Hindwings lanceolate, grey: cilia light grey.

Gooty (Campbell); one specimen.

Tinea plasmatica, n. sp.

♂ ♀. 24-27 mm. Head light greyish-ochreous. Palpi dark fuscous, terminal joint ochreous-whitish except towards base. Antennæ fuscous. Thorax light brownish, shoulders suffused with dark fuscous. Abdomen pale greyish-ochreous. Forewings elongate, rather narrow, in ♂ narrower, costa gently arched, apex pointed, termen extremely obliquely rounded; light greyish-ochreous, more or less mixed with brown, veins partially marked with dark fuscous lines; costa, dorsum, and termen marked with numerous small dark fuscous spots, and there is a median longitudinal series of similar spots connecting dark veins; a very oblique patch of dark fuscous suffusion from costa near base to fold; stigmata forming rather large suffused roundish dark fuscous spots, plical somewhat beyond first discal and confluent with it: cilia pale greyish-ochreous, with subbasal and postmedian shades of dark fuscous irroration. Hindwings grey; cilia pale greyish-ochreous.

Khasis, in December; two specimens.

Tinea orphnodes, n. sp.

♂ ♀. 14-19 mm. Head ochreous-yellow. Palpi dark fuscous, apex ochreous-whitish. Antennæ pale whitish-ochreous. Thorax dark purple-fuscous. Abdomen rather dark grey. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded; glossy pale ochreous, sometimes speckled with grey; costa variably suffused with dark grey anteriorly, sometimes only towards base, sometimes more broadly from base to $\frac{3}{4}$; usually a cloudy dark fuscous dot in disc at $\frac{3}{4}$, and apical patch of dark fuscous suffusion, but these are sometimes almost obsolete: cilia pale ochreous, sprinkled with fuscous, round apex more or less suffused with dark fuscous irroration. Hindwings rather dark bronzy-purplish-grey; cilia pale grey, with darker grey subbasal shade.

Khasis, from March to May and in August and November; seven specimens.

Tinea iritis, n. sp.

♂. 18-24 mm. Head yellow-ochreous. Palpi dark fuscous, sometimes yellowish towards apex. Antennæ nearly 1, whitish-ochreous. Thorax dark grey-purplish. Abdomen ochreous. Forewings elongate, rather narrow

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

costa moderately arched, apex obtuse, termen very obliquely rounded; dark grey-purplish, sometimes with strong indigo-green gloss: cilia grey-purplish, sometimes mixed with pale ochreous, towards base more greenish-purple. Hindwings light ochreous-fuscous; cilia pale ochreous, with fuscous subbasal shade.

Quetta (Nurse); Ajmere; from June to September, six specimens.

Tinea sacerdos, Wals.

♂ ♀. 22-36 mm. Head clear light yellow. Antennæ whitish. Thorax purple. Forewings purple. Hindwings rather dark purple-fuscous.

Konkan (Young); Karwar (Maxwell); Simla. I give short characters here to show its distinctness, as this group of nearly-allied unicolorous species requires care.

Tinea glabrella, Walk.

♂ ♀. 16-25 mm. Head clear light yellow. Antennæ white lined with blackish. Thorax lilac-brownish-ochreous. Forewings brownish-ochreous finely irrorated with fuscous, with strong lilac-purplish gloss. Hindwings rather dark purplish-grey.

Madulsima, Maskeliya, Haputale, and Matale, Ceylon (Vaughan, Pole, Alston, deMowbray); N. Coorg, 3,500 feet (Newcome).

Tinea opsigona, n. sp.

♂ ♀. 22-34 mm. Head deep yellow. Palpi short, dark fuscous, tip yellowish. Antennæ ochreous-whitish. Thorax lilac-yellow-ochreous. Abdomen deep ochreous-yellowish. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; yellow-ochreous, sometimes tinged with grey, with lilac-purplish gloss; costal edge purplish-fuscous towards base: cilia yellow-ochreous. Hindwings rather dark bronzy-purple-grey; cilia light greyish-ochreous or grey, with darker subbasal shade.

Peradeniya, Haldamulla, Gampola, Diyatalawa, Balangoda, Matale, and Pundaluoya, Ceylon (Green, Alston, Pole, Fletcher); Nilgiris, 3,500 feet (Andrewes); N. Coorg, 3,500 feet (Newcome); from February to October, sixteen specimens. This large species has been often regarded as identical with the equally large South African *vastella*, but is distinct.

Tinea cholœa, n. sp.

♂. 20-21 mm. Head pale greyish-ochreous. Palpi dark fuscous towards tips pale greyish-ochreous. Antennæ grey. Thorax dark ashy-fuscous. Abdomen grey. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen slightly rounded, rather strongly oblique; greyish-bronzy-ochreous, with slight prismatic reflections, sometimes sprinkled with fuscous; costa more or less suffused with dark ashy-fuscous on anterior half; a cloudy dot of fuscous suffusion in disc beyond $\frac{3}{4}$: cilia light bronzy-ochreous, sometimes sprinkled with grey. Hindwings bronzy-grey; cilia pale greyish-ochreous.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Diyatalawa, Ceylon, in September (Fletcher); two specimens. The colour of antennæ affords a good leading point of distinction in this group.

Tinea platyntis, Meyr.

♂ ♀. 14-20 mm. Head deep yellow. Antennæ ochreous-whitish. Thorax yellow-ochreous, more or less suffused anteriorly with dark purple-fuscous. Forewings yellow-ochreous, with faint purple gloss; costal edge more or less dark purple-fuscous towards base. Hindwings rather dark purple-grey.

Trincomali and Eppawela, Ceylon (Green, Fletcher); Cuddapah, 4,000 feet (Campbell); Nilgiris, 3,500-6,000 feet (Andrewes); N. Coorg, 3,500 feet (Newcome); Koni and Mone, Burma (Manders); in May and June, and from September to December.

Trophimæa testata, n. sp.

♂ ♀. 10-12 mm. Head pale whitish-ochreous. Palpi whitish, second joint externally marked with dark fuscous. Antennæ fuscous, ciliations in ♂ $1\frac{1}{2}$, basal tuft ochreous-whitish. Thorax ochreous-whitish, somewhat sprinkled with dark fuscous. Abdomen grey-whitish, in ♀ with large ochreous-whitish anal tuft. Forewings elongate, costa moderately arched, apex round-pointed, termen extremely obliquely rounded; 4 absent; whitish-ochreous sprinkled with white points, and more or less strewn with dark fuscous strigulæ; markings dark fuscous; a narrow rather oblique fascia near base, interrupted in middle; an irregular somewhat oblique fascia before middle; a spot on costa beyond middle; an irregular rather inwards-oblique fascia about $\frac{3}{4}$, narrowed on costa; a small spot on costa towards apex, and a series of five along termen: cilia ochreous-whitish, sprinkled with dark fuscous, tending to form undefined bars. Hindwings with 4 absent; pale grey; cilia ochreous-whitish.

Peradeniya and Madulsima, Ceylon (Green, Vaughan); in March and April, seven specimens. Very like *arenatella*, but larger, and easily distinguished by absence of vein 4 in both wings.

Lepidoscia globigera, n. sp.

♂. 13-15 mm. Head fulvous-ochreous. Palpi with loosely projecting scales, ochreous, somewhat mixed with dark fuscous. Antennæ dark fuscous, ciliations 4, fasciculated. Thorax dark purplish-fuscous. Abdomen dark fuscous. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex obtuse, termen very obliquely rounded; 7 absent; deep fuscous-purplish, suffusedly strigulated with dark fuscous; costa irregularly strigulated with whitish-ochreous; dorsum with a patch of whitish-ochreous strigulation extending from $\frac{1}{5}$ to $\frac{4}{5}$, widest before middle, where it reaches $\frac{1}{3}$ across wing; several small whitish-ochreous dots on termen: cilia fuscous-purplish mixed with dark fuscous, on termen with two or three undefined bars of ochreous-whitish suffusion. Hindwings and cilia rather dark purplish-bronzy-fuscous.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♀. Length 4 mm.; head small, antennæ and legs short and weak, slender, abdomen with whitish anal tuft; wings reduced to minute rudiments.

Haputale, Ceylon (Green); 9 ♂, 2 ♀, bred in February. Larva in a sub-globose egg-shaped case of silk covered with grains of refuse, feeding on lichens; length of case 8-10 mm., width 5-7 mm.

Mallobathra cellulata, n. sp.

♂. 12-13 mm. Head and palpi whitish-ochreous-yellowish. Antennæ dark fuscous, ciliations 4. Thorax and abdomen dark fuscous. Forewings elongate, costa moderately arched, apex rounded-obtuse, termen obliquely rounded; 6 present: dark purple-fuscous, costa sharply spotted with pale ochreous-yellowish, rest of wing wholly strewn with obscure suffused whitish-ochreous dots: cilia dark purple-fuscous, on costa barred with pale yellowish on spots, on termen with a basal series of pale yellowish spots, round apex with tips ochreous-whitish. Hindwings with 6 present; rather dark bronzy-fuscous; cilia fuscous, paler towards tornus.

Maskeliya, Ceylon, in January (Pole): seven specimens.

Elegistis, n. g.

Head rough; ocelli present; tongue absent. Antennæ $\frac{1}{2}$, in ♂ biciliated with long fascicles, basal joint moderate, without pecten. Labial palpi moderate, porrected, clothed with dense loose scales, obtuse. Maxillary palpi obsolete. Posterior tibiæ clothed with long hairs above. Forewings with 2 from towards angle, 7 to apex, 8 and 9 short-stalked, 11 from before middle. Hindwings under 1, elongate-ovate, cilia $\frac{3}{4}$; 5 absent, other veins separate, nearly parallel.

Elegistis cunicularis, n. sp.

♂ ♀. 10-13 mm. Head and thorax grey spinkled with grey-whitish and blackish. Palpi blackish sprinkled with grey-whitish. Antennal ciliations of ♂ 5. Abdomen dark fuscous. Forewings elongate, moderate, costa gently arched, apex obtuse, termen obliquely rounded; purplish-fuscous suffusedly irrorated with blackish; a moderate rather curved fuscous-whitish fascia at $\frac{1}{3}$, another at $\frac{2}{3}$ interrupted in disc, and a band of undefined cloudy spots towards termen, but these are always more or less obscured by dark fuscous irroration, and sometimes wholly obsolete and merged in ground colour: cilia dark purple-fuscous sprinkled with whitish points. Hindwings and cilia dark fuscous, purplish-tinged.

Maskeliya and Peradeniya, Ceylon (Green, Pole); in October, five specimens. Bred from larvæ tunnelling dead wood, making long external tubes of silk and refuse (Green).

Thisizima bubalopa, n. sp.

♂ 14-16 mm., ♀ 20 mm. Head ochreous. Palpi pale ochreous, second joint dark fuscous except towards apex. Antennæ pale ochreous. Thorax dark purplish-fuscous. Abdomen light fuscous. Forewings elongate, costa

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

moderately arched, apex obtuse, termen very obliquely rounded; dark purplish-fuscous, with indigo-blue reflections: cilia concolorous. Hindwings bronzy-fuscous; cilia light bronzy-fuscous, paler or whitish-tinged towards tips.

Peradeniya, Ceylon (Green); Nilgiris, 3,500 feet (Andrewes); in May, July, and December, eight specimens.

Myrmecozela, Zell.

Head loosely rough-haired; ocelli present; tongue absent. Antennæ $\frac{2}{3}$, in ♂ stout, compressed, simple, basal joint short, without pecten. Labial palpi moderate, ascending, second joint clothed with dense rough scales, with long projecting lateral bristles, terminal joint short, loosely scaled, somewhat obtuse. Maxillary palpi obsolete. Posterior tibiæ loosely scaled above. Forewings with 2 from towards angle, 7 to apex, 8 and 9 rather approximated, 11 from before middle. Hindwings 1, elongate-ovate, cilia $\frac{1}{2}$; 2-7 tolerably parallel.

This genus apparently indicates the passage from *Melasina* to *Thisizima*.

Myrmecozela leontina, n. sp.

♂ 17-18 mm., ♀ 24 mm. Head, palpi, thorax, and abdomen deep ochreous. Antennæ pale ochreous. Forewings elongate, somewhat dilated posteriorly, costa moderately arched, apex rounded-obtuse, termen obliquely rounded; brownish-ochreous; more or less faintly indicated cloudy fuscous spots round posterior part of costa and termen: cilia brownish-ochreous, outer half suffused with fuscous. Hindwings rather dark purplish-fuscous; cilia pale ochreous tinged with fuscous, with fuscous subbasal shade.

Kulu, Punjab; four specimens.

Myrmecozela glebifera, n. sp.

♂ ♀. 15-18 mm. Head and thorax ochreous-brown, face ochreous. Palpi ochreous, sometimes mixed with dark fuscous. Antennæ and abdomen dark fuscous. Forewings elongate, costa gently arched, apex rounded-obtuse, termen obliquely rounded; rather dark purple-fuscous mostly suffused with ochreous-brown, the dark ground colour appearing to form obscure strigulæ; posterior part of costa and termen more distinctly spotted with dark fuscous: cilia dark purple-fuscous, base pale ochreous. Hindwings and cilia dark fuscous, faintly purplish-tinged.

Khasis, from March to May; fourteen specimens.

Myrmecozela metrophora, n. sp.

♂. 12-14 mm. Head greyish-ochreous, face whitish-ochreous. Palpi whitish-ochreous mixed with dark fuscous. Antennæ and abdomen dark fuscous. Thorax fuscous. Forewings elongate, costa moderately arched, apex rounded-obtuse, termen rounded, rather strongly oblique; fuscous or ochreous-fuscous, more or less suffusedly irrorated with dark fuscous; costa and termen regularly marked throughout with suffused dark fuscous

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spots; a suffused dark fuscous spot in disc at $\frac{2}{3}$: cilia light brownish-ochreous or fuscous, obscurely barred with dark fuscous irroration. Hindwings and cilia rather dark fuscous.

Ajmere, in July; three specimens.

Sapheneutis galerita, n. sp.

♂. 15 mm. Head and palpi dark fuscous. Antennæ whitish-ochreous, basal joint dark fuscous, ciliations $2\frac{1}{2}$. Thorax whitish-ochreous, anterior half dark fuscous. Abdomen pale whitish-ochreous. Forewings elongate, moderate, costa gently arched, apex rounded-obtuse, termen obliquely rounded; 7 and 8 separate; whitish-yellowish; costal edge dark fuscous towards base; a round blackish dot in disc at $\frac{2}{3}$: cilia whitish-yellowish. Hindwings and cilia yellow-whitish.

Sikkim, 4,500 feet, in August (Dudgeon); one specimen. Allied to *S. metacentra*.

Machæropteris, Wals.

Head rough-scaled; ocelli present; tongue absent. Antennæ under $\frac{1}{2}$, in ♂ very slender, simple, basal joint short. Labial palpi moderate, second joint clothed with long dense projecting tuft of rough scales beneath and expanded bristles or long rough hair scales laterally and at apex above, terminal joint short, slender, obtuse, ascending, more or less concealed in scales of second joint. Maxillary palpi obsolete. Thorax with posterior crest. Anterior tibiæ and tarsi short, posterior tibiæ rough-haired above, in ♂ with these hairs usually more or less elongate and expansible. Forewings with numerous tufts and ridges of raised scales on surface; 2 from angle, sometimes stalked with 3, 7 to costa or apex, separate or stalked or coincident with 8, 9 and 10 sometimes approximated or short-stalked, 11 from before middle. Hindwings 1, elongate-ovate, cilia $\frac{1}{2}$; 2-7 separate, 5 and 6 more or less approximated at base.

Type *phenax*, Meyr. (*receptella*, Wals., *nec* Walk.). This curious genus at first seems to present difficulties, as the obscurely-coloured species have usually no defined markings, and are apparently seldom obtained in good condition; but on examination of the form of wing and neuration they are found to be really easily determinable. The antennæ are unusually short and slight, and I know no other genus of *Lepidoptera* in which they are so slender and weak in the ♂. *Dasyses*, Durr., and *Trachycentra*, Meyr., are allied genera. I give a tabulation of the species based on trustworthy points of difference:—

1.	Vein 7 of forewings absent	*taciturna*.
	Vein 7 of forewings present	2.
2.	Vein 7 of forewings to apex	3.
	Vein 7 of forewings to costa	6.
3.	Apex of forewings pointed	4.
	Apex of forewings rounded-obtuse	5.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

4.	Apex of forewings much produced	*phenax.*
	Apex of forewings not produced	*limatula.*
5.	Forewings moderate, with dark median fascia ..	*frenigera.*
	Forewings rather narrow, without fascia	*vernacula.*
6.	Head and palpi whitish-ochreous	*melicera.*
	Head and palpi brownish or dark fuscous	7.
7.	Forewings with 7 and 8 stalked	*receptella.*
	Forewings with 7 and 8 separate	8.
8.	Apex of forewings produced, head dark fuscous ..	*horrifera.*
	Apex of forewings not produced, head brownish ..	9.
9.	Apex pointed, tibial hairs whitish-ochreous	*halistrepta.*
	Apex round-pointed, tibial hairs grey	*ceramina.*

Machæropteris taciturna, n. sp.

♂ ♀. 24-27 mm. Head, palpi, and thorax fuscous, more or less mixed or suffused with dark fuscous. Abdomen dark fuscous. Forewings elongate, costa moderately arched, apex round-pointed, termen hardly sinuate, oblique; 7 absent, 9 and 10 approximated or stalked; fuscous, suffusedly irrorated with dark fuscous, without defined markings: cilia fuscous sprinkled with pale ochreous, more or less obscurely barred with dark fuscous suffusion. Hindwings rather dark purplish-bronzy-fuscous; cilia fuscous.

Madulsima and Hakgala, Ceylon (Vaughan, Green); from March to May, five specimens.

Machæropteris receptella, Walk.

(*Tinea receptella*, Walk, Cat. XXVIII, 479.)

♂ ♀. 16-20 mm. Posterior tibiæ in ♂ with extremely long expansible grey hairs. Forewings with apex pointed, produced, termen sinuate, oblique; 7 and 8 stalked, 7 to costa, 9 and 10 approximated or short-stalked; fuscous, irregularly irrorated with dark fuscous. Hindwings dark grey.

Peradeniya, Colombo, and Trincomali, Ceylon (Green, Mackwood, Fletcher); in April, July, October and December, seven specimens.

Machæropteris halistrepta, n. sp.

♂ ♀. 23-27 mm. Head and thorax ochreous-brownish, usually more or less variably irrorated with dark fuscous. Palpi brownish, hairs suffused with dark purple-fuscous except towards base. Abdomen rather dark grey. Posterior tibiæ in ♂ with long whitish-ochreous hairs. Forewings elongate, costa moderately arched, apex pointed, termen somewhat sinuate, oblique; 7 separate, to costa, 9 and 10 approximated; lilac-brown, closely irrorated with brownish-ochreous, usually with some irregular undefined and variable groups of dark fuscous scales: cilia lilac-brownish irrorated with pale ochreous, more or less barred with dark fuscous, especially at apex. Hindwings rather dark purplish-fuscous; cilia fuscous sprinkled with ochreous-whitish.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Puttalam, Ceylon (Pole); Gooty (Campbell); Konkan (Young); in December, six specimens. Larval case elongate, nearly flat, parallel-sided (12 mm. × 4 mm.), both ends rounded; composed of silk and grains of refuse, but entirely coated with silk outside; sent without note of habits (Campbell), possibly a wood-feeder, or on dead leaves, but the case is not suitable for a lichen-feeder.

Machæropteris ceramina, n. sp.

♂ ♀. 30-39 mm. Head brownish. Palpi brownish irrorated with dark fuscous. Thorax dark brown or dark fuscous. Abdomen fuscous. Posterior tibiæ in ♂ with extremely long expansible fine greyish hairs. Forewings elongate, costa moderately arched, apex round-pointed, termen sinuate, oblique; 7 separate, to costa, 9 and 10 remote; dark brown, suffusedly irrorated with dark fuscous or sometimes partially with blackish, costa sometimes obscurely darker-spotted: cilia brown, mixed with dark brown and sprinkled with pale ochreous. Hindwings rather dark fuscous; cilia fuscous.

Maskeliya, Peradeniya, and Bogawantalawa, Ceylon (Pole, de Mowbray, Green): in October, November, and May, seven specimens.

Machæropteris phenax, n. sp.

(*Machæropteris receptella*, Wals. (*nec* Walk.), Moore Lep. Ceyl. III, 502, pl. ccviii, 14.)

♂ ♀. 28-36 mm. Head brownish. Palpi dark brown, scales with ochreous-whitish tips. Thorax dark brown. Abdomen dark fuscous. Forewings elongate, costa moderately arched, apex much produced, acute, termen sinuate, oblique; 2 and 3 approximated or sometimes stalked, 7 separate, to apex, 9 and 10 remote; brown or purplish-fuscous, irrorated with dark fuscous, with some bluish-leaden scales, without defined markings: cilia lilac-brownish sprinkled with dark fuscous, towards base yellow-ochreous, at apex with a projection of dark fuscous scales. Hindwings dark fuscous; cilia fuscous sprinkled with dark fuscous, base pale ochreous.

Peradeniya, Ceylon (Green); in August and December, four specimens. I am indebted to Mr. J. Hartley Durrant for the information that this was the species on which the genus *Machæropteris* was founded, and not the true *receptella*, Walk.

Machæropteris horrifera, n. sp.

♂. 22 mm. Head, palpi, and thorax dark fuscous. Abdomen fuscous. Posterior tibiæ with very long fuscous hairs. Forewings elongate, costa moderately arched, apex pointed, produced, termen sinuate, oblique; 2 and 3 connate, 7 to costa, separate, 9 and 10 approximated at base; dark purplish-fuscous, raised scales with a bluish-leaden gloss: cilia dark purplish-fuscous. Hindwings and cilia fuscous.

Sikkim, in August (Dudgeon); one specimen.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Machæropteris limatula, n. sp.

♂. 22 mm. Head brownish. Palpi brownish, slightly sprinkled with whitish points. Thorax brownish-ochreous sprinkled with dark fuscous. Abdomen dark grey. Forewings elongate, rather narrow, costa moderately arched, apex pointed, termen sinuate, very oblique; 7 to apex, separate, 9 and 10 remote; ochreous-brownish, some scales finely tipped with black; a broad streak of whitish-ochreous suffusion along fold from near base to beyond middle, and a rather elongate patch in disc beyond middle: cilia purplish-ochreous sprinkled with dark fuscous, basal third brownish-ochreous limited by a fine black line. Hindwings and cilia dark grey.

Hakgala, Ceylon, in April (Green); one specimen.

Machæropteris frenigera, n. sp.

♀. 24-25 mm. Head, palpi, and thorax whitish-fuscous suffused with darker and more or less mixed with dark fuscous. Abdomen rather dark grey, protruded ovipositor as long as abdomen. Forewings elongate, moderate, costa moderately arched, apex rounded-obtuse, termen obliquely rounded; 7 to apex, separate, 9 and 10 remote; light fuscous irrorated with dark fuscous, tending to form transverse strigulæ; a transverse streak of dark fuscous suffusion from beyond middle of costa to dorsum before tornus: cilia whitish-fuscous, with several fuscous lines. Hindwings rather dark grey; cilia grey, with darker subbasal line.

Colombo, Ceylon, in November (Mackwood); two specimens.

Machæropteris vernacula, n. sp.

♀. 14 mm. Head, palpi, and thorax fuscous. Abdomen dark grey, apex ochreous. Forewings elongate, rather narrow, costa moderately arched, apex rounded-obtuse, termen obliquely rounded; 7 to apex, separate, 9 and 10 separate; lilac-brown, irrorated with dark fuscous: cilia brownish, with two dark fuscous lines. Hindwings dark purple-grey: cilia grey, with darker subbasal line.

Madulsima, Ceylon, in June (Green): one specimen.

Machæropteris melicera, n. sp.

♂ ♀. 21-30 mm. Head and palpi whitish-ochreous. Thorax whitish-ochreous, anteriorly suffused with fulvous-ochreous. Abdomen grey. Posterior tibiæ in ♂ with moderate whitish-ochreous hairs. Forewings elongate, costa moderately arched, apex pointed, produced, termen sinuate, oblique; 2 and 3 sometimes connate or short-stalked, 7 to costa, 7 and 8 sometimes stalked, 9 and 10 remote; whitish-ochreous, more or less strewn with small ferruginous-ochreous spots and strigulæ; costa suffused with ferruginous-ochreous towards base; sometimes two very oblique fuscous fasciæ before and beyond middle respectively, edged with ferruginous-ochreous, and a streak running from lower extremity of first through middle of second to costa before apex, but these markings are sometimes very faintly indicated or quite obsolete: cilia whitish-ochreous mixed with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ferruginous-ochreous and sometimes sprinkled with dark fuscous. Hindwings and cilia rather dark fuscous.

Maskeliya, Ceylon (Pole); from January to July, six specimens.

PLUTELLIDÆ.

Lamyristis, n. g.

Head shortly rough-scaled; ocelli present; tongue absent. Antennæ $\frac{1}{3}$, in ♂ ciliated, basal joint short. Labial palpi moderately long, rather curved, somewhat ascending, second joint with compressed tuft of very long rough projecting scales beneath, terminal joint shorter, rather slender, obtuse. Maxillary palpi obsolete. Thorax with posterior expansible tuft of hair-scales. Abdomen in ♀ with large anal tuft. Anterior tibiæ moderately long, loosely expanded with scales, tarsi very short: posterior tibiæ with appressed scales. Forewings with 2 from towards angle, 7 and 8 long-stalked, 7 to termen, 9 and 10 from near 8, 11 from somewhat before middle. Hindwings 1, oblong-ovate, cilia $\frac{1}{2}$; 3 and 4 connate, 5-7 nearly parallel.

I describe this genus here, because superficially the species has considerable general resemblance to a *Machœropteris*, and also some points of curious similarity in structure, but I do not consider that there is any real connection. The true relationship of the genus is with *Anticrates*, Meyr.

Lamyristis leucopselia, n. sp.

♂ ♀. 17-20 mm. Head ochreous-whitish more or less mixed with fuscous. Palpi fuscous, tuft of second joint suffused with ochreous-whitish towards base. Thorax dark fuscous, posterior edge marked with white. Abdomen rather dark fuscous, anal tuft fuscous. Forewings elongate, moderate, costa rather strongly arched, apex obtuse, termen slightly sinuate, oblique; deep purple, suffusedly irrorated with dark fuscous; costal edge somewhat spotted with ochreous-whitish suffusion, especially on a patch before middle; a clear white spot on dorsum before middle, and two white dots placed transversely above it: a white dot on dorsum before tornus; three white dots on costa towards apex: cilia dark purplish-fuscous, with white patches above and beneath apex. Hindwings dark bronzy-fuscous; cilia fuscous, with dark fuscous subbasal line.

Maskeliya, Ceylon, in May (Pole, Alston); three specimens. The white patches in the cilia of forewings produce the optical effect of the unusual form of the apex and cilia in *Machœropteris phenax*.

(*To be continued*).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

REPTILES COLLECTED IN CHITRAL.

By

Major F. Wall, I.M.S., C.M.Z.S.

Whilst stationed in Chitral in 1910, I managed to secure a good representative collection of the snakes of that State, and several lizards and batrachians. The region is by no means rich in species, but what there are are very abundant for the most part.

REPTILIA.

Squamata.

Lacertilia.

Without making any special search for lizards, I managed to collect a few species.

Gymnodactylus stoliczkæ (Steindachner).

This was by no means uncommon. I encountered it several times in the Fort at Drosh, among old packing cases or rubbish by day, and in the open after nightfall. Two fell into my basin at different times, and I came across others on the verandah floors when returning to my quarters at night. It is fairly agile.

Calotes versicolor (Daudin).

Rather uncommon. I saw but a few specimens at low elevations (4,000 to 5,000 feet). I noticed that the gular scales were distinctly keeled and that there was an oblique fold in front of the shoulder, though Boulenger (Faun. Brit. Ind., 1890, p. 136) says the gular scales are smooth or feebly keeled, and there is no fold in front of the shoulder. Chitral appears to be about the most northern limit from which this species has been recorded.

Agama tuberculata (Gray).

At an altitude of from 5,000 to 10,000 feet, this is as common in Chitral as it is in the Western Himalyas (Mussoorie, Almora). I found it up to about 12,000 feet.

Agama himalayana (Steindachner).

This was a very common lizard about Madaglasht, and I found it up to 11,000 feet or more. Like the last it lives among rocks coming out to bask in the sun, and scuttles into any cranny when disturbed. It is remarkable how it manages to capture butterflies as wary as the common painted lady (*Vanessa cardui*). On several occasions I found it devouring this species. Boulenger does not remark upon the peculiar and attractive colouration of the head, which is a rather bright yellow, and there is a large and conspicuously bright orange patch on each temporal region.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Varanus griseus (Daudin).

I had one specimen brought to me on the 25th May which measured 21 inches from snout to anus, and the tail, though slightly deficient, also measured 21 inches. Boulenger calls it a desert species, and makes no reference to it among hills, so that its occurrence in the heart of the Himalayas close to the Hindu Kush at an altitude of about 4,000 feet is noteworthy.

Lygosoma himalayanum (Günther).

At 10,000 feet this was a very common little lizard. Its numbers must be considerably checked by the pit-viper (*Ancistrodon himalayanus*) which preys upon it extensively.

OPHIDIA.

Snakes, though fairly abundant in Chitral, were represented by but few species. The name for a snake is "āe," a corruption of the Arabic name "afāe" I am told, but there is no Chitrali name for any of the species, not even the cobra which is very common.

COLUBRIDÆ.

Tropidonotus tessellatus (Laurenti.)

Three specimens of this species were captured near Mastuj in July at an altitude of about 6,000 feet. The species was plentiful there in a piece of ground adjoining a stream. I obtained it nowhere else.

Chitralis had told me that a snake frequents the hot springs in their country and I made every endeavour to get specimens. A cooly was sent on three occasions to the springs they were supposed to inhabit, but his labours were fruitless. I very much suspect that this snake is the one referred to, and that the water need not be hot to suit their tastes.

Two of my specimens were ♂♂, and the third a ♀. One killed between the 14th and 22nd July discharged two eggs during its death throes.

The ventrals and subcaudals were 182+66 and 180+ 67 in the ♂♂ and are not recorded in the third specimen.

The lepidosis in every respect agreed with that of the many Persian specimens I have examined. One specimen had swallowed a good-sized newt, that was too digested about the head to identify. As far as I am aware the species has never before been recorded East of the Hindu Kush and its known habitat is therefore much extended.

Dentition.—The *maxillary* in my skull supports 26 teeth in an uninterrupted series, the hinder gradually enlarged. This condition conforms to that of the genus *Nerodia* (Baird and Gir). *Palatine* 13 to 15. *Pterygoid* 17 to 19. *Mandibular* 26 to 28. It completely accords with my three Persian skulls.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Zamenis mucosus (Linné).

This is common, as much so perhaps as in most parts of India, but decidedly less numerous than *Z. diadema* in Chitral. I obtained 20 specimens of which 7 were ♂♂, and 13 ♀♀. The largest was a ♀ which measured 6 feet. A little one only 18 inches long when pursued by an Irish terrier faced round, and bit the dog most viciously. 6,000 feet was the highest altitude at which I obtained a specimen. Three specimens that had recently fed were found to contain toads (*Bufo viridis*) when dissected. Most of the examples had only two loreal shields (1+1), as in *korros*. In other parts of India it is quite unusual to find only two of these shields. In one specimen there was but one loreal on the left side with two on the right side. In one specimen there were 9 supralabials with the 5th and 6th touching the eye on the right side, and in another 9 with the upper part of a divided 4th, the 5th and 6th touching the eye on both sides. The ventrals in the ♂ were 194 to 197 and in the ♀ 192 to 202. The subcaudals in the ♂ were 112 to 119, and in the ♀ 109 to 122. The scales two heads-lengths behind the head were 17, in midbody 17 usually (once 16 and once 15), and two heads-lengths before the anus 12 or 14 (not influenced by sex). The rows became 16 invariably by the absorption of the vertebral into the adjacent row on the left side. In the succeeding steps the 3rd row above the ventrals disappears being absorbed into the 2nd usually (rarely the 4th).

Zamenis rhodorhachis (Jan.).

I collected 16 specimens all from elevations between 4,000 and 5,000 feet. Three of these conformed to variety *typica*, and the remainder to variety *ladacensis* (Anderson).

Of the 16, 7 were ♂♂, 8 ♀♀ and one was not sexed.

Variety *ladacensis* is extremely like the species *Z. ventrimaculatus* (Gray). So much so that I think it probable the two have been confused by most if not all writers hitherto. Boulenger (Faun. Brit. Ind., 1890, p. 326) says it differs in having more numerous ventrals and subcaudals, but that in other structural characters it agrees with *ventrimaculatus*. With this I cannot agree. In the first place the large series of both species that I have examined shows that no difference can be claimed in the respective ranges of the ventrals and subcaudals, and in the second place a very clear distinction can be shown in the dentition of the two species. Thus, in *rhodorhachis* a gap precedes the two last maxillary teeth which are much enlarged, but in *ventrimaculatus* no such gap exists and the posterior teeth are not enlarged.* This difference appears to me of sufficient importance to warrant generic distinction between the two.

I did not examine the dentition in every Chitral specimen, though I

---

*My skull is from a specimen killed at Campbellpore, Punjab.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

did so in most. In all examined (both *typica* and *ladacensis*) there was a gap posteriorly in the maxillary array succeeded by two enlarged teeth. In this as in other respects they agreed with specimens I have seen from Karachi and Baluchistan.

I can find no constant differences in lepidosis, by which *rhodorhachis* can be distinguished from *ventrimaculatus*.

The details of my specimens are as follows:—

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-length after head.	Midbody.	2 heads-lengths before vent			
		Variety *ladacensis*.						
25-10-09	♀	3′-8″	19	19	13	239	136	A lizard *Calotes versicolor* in the stomach.
5-11-09	♀	1′-2¾″	19	19	13	221	?	Tail imperfect.
21-11-09	♂	4′-0¼″	19	19	13	235	?	Tail imperfect. A large *Calotes versicolor* in the stomach.
29-11-09	♂	1′-6″	19	19	13	230	?	Tail imperfect. 126 subcaudals counted.
3-12-09	♂	1′-1⅞″	19	19	13	206?	112	
20-5-10	♂	2′-8″	19	19	13	208	?	Tail imperfect. 120 subcaudals counted.
23-5-10	♂	3′-2″	19	19	13	208	?	Tail imperfect.
24-5-10	♀	3′-0¼″	19	19	14	213	?	Tail imperfect. Eight eggs in abdomen $\frac{13}{16}'' \times \frac{7}{32}''$.
25-5-10	?	1′-2½″	19	19	15	213	?	Tail imperfect. A gecko probably *Gymnodactylus stoliczkæ* in the stomach.
25-5-10	♀	2′-11″	19	19	15	220	115	Three eggs in the abdomen about ⅝ inch long.
8-9-10	♀?	1′-0⅞″	19	19	13	221	?	Tail imperfect. 108 subcaudals counted.
23-9-10	♀	1′-1¼″	19	19	15	216	118	
1-10-10	♂	1′-5¾″	19	19	15	212	120	A young *Calotes* lizard in the stomach.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Date.	Sex.	Length.	Costals. 2 heads-lengths after head	Costals. Midbody.	Costals. 2 heads-lengths before vent.	Ventral.	Subcaudals.	Remarks.
		Variety *typica*.						
12-6-10	♀	3′-4¼″	19	19	15	222	122	Heavily gravid. Contained 9 eggs from 1 to 1½ inches long with no trace of embryo.
17-9-10	♂	1′-10″	19	19	13	211	111	A gecko *Gymnodactylus stoliczkæ* in the stomach.
6-10-10	♀	2′-10¾	19	19	13	215	113	

The costals reduce to 15 or 13 posteriorly irrespective of sex. In the reduction from 19 to 17 the 8th row above the ventrals is absorbed into the 7th usually (more rarely the 9th). From 17 to 15 the 3rd row above the ventrals disappears, being absorbed into the 4th usually (rarely the 2nd). These two steps occur quite close together, and may be reversed or mixed. When the rows still further reduce to 13, as is the rule, it is the 7th row above the ventrals that is absorbed. The supralabials are usually 9, the 4th divided, and its upper part with the 5th and 6th shields touch the eye. Rarely there are 8 in the series, and then the 3rd is divided, and with the 4th and 5th touches the eye. The tongue is pinkish with blackish tips. The eye has a narrow golden pupillary margin, with fine specks of gold interspersed through the iris. The ♂ claspers are beset with many falciform tentacles. The anal glands furnish a white secretion. In *ladacensis* the colour is olive-greyish, or olive-greenish, and there are usually 6 rows of quincunciate, small, blackish, round spots, most conspicuous anteriorly. Sometimes these spots are absent. There is usually a small round blackish spot at the side of each ventral especially marked in the anterior ones, but these may be absent. The belly is otherwise a pearly white, with sometimes some pinkish suffusion posteriorly. In variety *typica*, the vertebral stripe was a bright rosy pink in two specimens, but a brownish-red in the third. There are spots on the ventrals as in the last, and the belly was a pale creamy-yellow, or pale sulphur-yellow. I do not think there were any dorsal quincunciate spots, but I have failed to specially mention their absence in my notes. In both varieties there is a periorbicular buff zone, and the overlapped parts of the scales especially in the forebody are black basally, whitish apically. These hues show up only when the snake under excitement dilates itself, at other times they are quite concealed.

The species is remarkably slender in habit, wide awake, and active.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

slipping away into cover so rapidly that it is difficult to capture alive. Many were killled in the Fort. The teeth were examined in Nos. 1, 5, 6, 7, 8, 14, 15 and 16. There were 13 or 14 maxillary teeth before the gap in Nos. 1, 5, 6, 7 and 16; and 10 or 11 before the gap in the remainder.

I have 6 skulls in my collection. The habitat of two is unknown, one is from Karachi and the rest from Chitral (Nos. 1, 8 and 16).

The dentition is as follows:—*Maxillary*—10 to 14 small teeth gradually increasing in size from before backwards, then a gap that would accommodate one tooth, followed by two enlarged, compressed and obliquely placed teeth, one-third longer to twice as long as the preceding. *Palatine*—9 to 11, slightly decreasing in size from before backwards. *Pterygoid*—15 to 24, slightly decreasing in size from before backwards (one in which habitat is unknown has 24, and No. 1 Chitral specimen has 22 and 23, all the rest from 15 to 18). *Mandibular* 15 to 20, the anterior and posterior slightly decreasing in size.

Zamenis ravergieri (Ménétr).

I collected 7 examples of this very elegant species at altitudes varying from about 9,000 to 11,000 feet. Of these 4 were ♂♂ and 3 ♂♂. I do not think it has been previously recorded East of the Hindu Kush, so that its habitat is materially extended. One specimen was picked up in a snow drift at about 11,000 feet apparently dead, but revived in the warmth of the hand. The details of the specimens follow:—

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	Remarks.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
5-7-10	♂	1′ 9⅝″	21	21	16	206	?	Tail imperfect.
6-7-10	♀	3′ 6″	21	21	15	220	88	
12-7-10	♀	3′ 7″	21	21	15	223	83	The stomach contained the hair of some digested mammal.
14-7-10	♂	3′ 8″	21	21	15	209	89	
14-7-10	♂	3′ 10½″	21	21	15	212	96	Killed in the act of attacking a nest of fledglings some of which I found in the stomach.
14-7-10	♀	3′ 4½″	21	21	15	218	87	
23-8-10	♂	3′ 3¾″	21	21	15	208	90	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

In one specimen the 10th row above the ventrals divided, and fused several times in the anterior two-fifths of the body, the scales being therefore in 23 rows in places. I have noted the same thing once before in a specimen (No. 4609) in the Indian Museum, the 10th row again dividing at least once, the resulting rows reuniting later.

The young are especially handsome, with their very conspicuous, large, chocolate, or black spots in three series. These, and other markings become much less distinct with age, in fact may become very much obscured.

Several specimens reached me alive. I found them restless, active, and wary creatures, but playing with them cautiously none ever attempted to bite me.

In life the iris is speckled with gold, and exhibits a narrow orbit of gold around the pupil which is a horizontal ellipse in shape rather than a circle.

I prepared two skulls, and the dentition is as follows :— *Maxillary*—13 teeth gradually increasing in length from before backwards; followed by a gap that would accommodate one tooth, behind which are two enlarged, and obliquely set teeth about one-fourth longer than the immediately preceding. *Palatine*—9, very slightly reducing in length anteriorly and posteriorly. *Pterygoid*—14 to 19, gradually decreasing in length from before backwards. *Mandibular*—16 to 19, reducing in length anteriorly and posteriorly. I may mention here that nearly four years ago I received a fragment of a skin of this snake from Mr. (now Captain) C. H. Whitehead from near the Peiwar Kotal in the Kurram Valley, N.-W. Frontier, *circa* 7,000 feet. Mr. Whitehead told me he found fragments of a mutilated snake in the nest of a kite (*Milvus govinda*), and sent me about three inches of the skin. I wrote at the time that it was part of a snake quite unfamiliar to me which I thought would prove to be a species of *Zamenis*. The scale rows in the fragment counted 17 and 15. I pasted this fragment into my note-book, and recognised the first *ravergieri* I saw in Chitral as the same snake.

Zamenis diadema (Schlegel).

I think this is the commonest snake in Chitral at elevations up to about 4,000 to 5,000 feet. Writing recently on the snakes in the Quetta Museum, I commented upon at least three varieties of this snake. In Chitral I only saw one variety, *viz.*, *typica*, that ornamented with large brownish-black or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

chocolate spots in three series. The species has, I believe, not been recorded up to date as far north as Chitral. A detail of the specimens follows :—

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	Remarks.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
10-10-09	♂	2′-11″	27	29	19	241	?	Tail imperfect.
27-10-09	♂	..	25	29	17	243	104	
28-10-09	♀	4′-1″	27	31	21	248	?	Tail imperfect.
11-11-09	♀	4′-4¼″	27	31	21	248	?	Tail imperfect.
17-11-09	♀	4′-11″	27	29	19	248	?	Tail imperfect.
17-11-09	♀	4′-3″	27	31	21	255	?	Tail imperfect.
8-12-09	♂	3′-8″	25	29	19	240	?	Tail imperfect.
8-12-09	♀	3′-5″	..	..	..	..	..	
12-2-10	♀	1′-8½″	27	31	21	254	103	Found on a cold wet day with deep snow on the ground.
2-3-10	♀	1′4⅝″	25	29	19	252	103	
15-3-10	♂	4′-1¾″	26	31	21	251	?	Tail imperfect.
1-4-10	♂	2′-6½″	25	29	19	239	?	Tail imperfect.
23-5-10	♂	4′-6⅝″	25	29	19	233	?	Tail imperfect.
27-5-10	♂	4′-2″	25	29	19	245	110	
28-5-10	♂	3′-11¼″	27	31	19	239	104	
31-5-10	♂	4′-4″	27	31	19	241	106	
1-6-10	♂	4′-7¾″	27	29	19	240	?	Tail imperfect.
8-6-10	♀	4′-1½″	25	29	19	247	?	Tail imperfect.
14-6-10	♂	3′-5¾″	25	29	19	241	108	One tick (*Aponomma* Spec ?) found attached on the back.
25-6-10	♀	3′-6″	..	..	..	..	..	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
3-7-10	♂	5′-3½″	..	..	..	..	..	
10-7-10	♀	3′-2″	..	..	..	..	..	
13-8-10	♀	3′-10″	28	31	21	250	?	Tail imperfect.
2-10-10	♀	2′-4″	25	29	19	252	104	

Of the 24 specimens 12 were ♂♂ and 12 ♀♀. Other specimens were sent to me in a state of putrefaction collected in Drosh, whilst I was absent at Madaglasht (—June to 21st September).

It is very remarkable that among all these specimens no single ♀ showed signs of being gravid, though all were dissected. Perhaps the breeding season was during the hot months when I was absent at the Sanatarium. The large number of imperfect tails in this, and other snakes is to be accounted for, by the Chitralis seizing this appendage, when the snake often screws itself loose leaving part of its tail behind. The costal rows are peculiar, being always fewer anteriorly than in midbody. Where the rows increase from 25 to 27, from 27 to 29 or from 29 to 31 the extra row appears on each side below the row adjacent to the vertebral, that is to say, where 25 becomes 27 a row appears between the 11th and 12th rows above the ventrals, where 27 becomes 29, it appears between the 12th and 13th, and where 29 becomes 31, it appears between the 13th and 14th. The reduction of rows is affected with one exception by the absorption of the 2nd row from the vertebral into one of its adjacent rows, *i.e.*, where 31 becomes 29, the 14th row above the ventrals disappears, where 23 becomes 21, the 10th row disappears. In one step the 3rd row above the ventrals is absorbed, and this is usually the second or third step in the reduction process; but as the first three steps occur close together, they are occasionally reversed or intermixed so far as the absorption of rows is concerned.

The ♂ claspers are furnished with cartilaginous, pedunculated processes. The anal glands produce a custard-like material.

I found this species infested with small, encysted, white parasites about the size of lentils which were scattered all over the peritoneum. I submitted some to Professor A. E. Shipley, who reported that they were protozoa, probably sarcosporidia but possibly myxosporidia.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Naia tripudians (Merrem).

The cobra is a very common snake in Chitral up to about 5,000 feet elevation, and is chiefly represented by the variety *oxiana* of Eichwald. I have already referred to, and figured this variety in this Journal (Vol. XIX, p. 1001). It is peculiar in having no suspicion of a hood mark, and in being banded dorsally. The anterior two, three or four bands are black or blackish, and any succeeding ones brownish. In young specimens the bands are quite conspicuous to the vent. I have seen a specimen in our Society's collection from Aden and another from Parachinar on our N. W. Frontier. It was also the only variety of cobra I met with in Malakand some years ago.

I collected 16 specimens 5 ♂ ♂, and 11 ♀ ♀ ; some of these were killed inside the Fort at Drosh. One came into an officer's bed-room at night, and and on another occasion in camp one came after nightfall into an officer's tent. The furious barking of a chained terrier attracted our attention at dinner-time, and we found the cobra sitting up facing the dog. It was so taken up with the dog, that it ignored our presence even with a lighted lantern, and was despatched without any trouble. Another passed through my pony's legs one day in broad day-light, and only when I halted, did it erect itself. It struck me that its hood is not so expansive as in the binocellate variety usually seen in India.

The details of my specimens are as follows:—

Date.	Sex.	Length.	Scales.			Ventrals.	Subcaudals.	Remarks.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
13-10-09	♂	1′-8″	19	19	15	195	69	
17-10-09	♀	3′-5″	23	22	15	210	62	
18-10-09	♀	2′-10⅝″	21	21	15	209	69	
20-10-09	♀	1′-4½″	19	21	15	205	63	
24-10-09	♀	3′-2¼″	21	21	15	213	64	
2-11-09	♂	1′-7⅜″	20	21	15	206	69	
7-11-09	♀	1′-4⅜″	21	21	15	207	63	
11-11-09	♂	3′-1″	21	21	15	211	69	
21- 5-10	♀	1′-7¼″	..	..	..	..	..	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Date.	Sex.	Length.	Scales.			Ventrals.	Subcaudals.	Remarks.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
24 -5-10	♀	1′-6⅝″	..	..	..	..	..	
24 -5-10	♀	3′-11″	21	21	15	207	60?	
3 -6-10	♂	3′-2½″	21	21	13	203	70	
5 -6-10	♂	4′-3″	19	21	14	207	63	
16 -9-10	♀	4′-9″	21	21	15	202	?	
28- 9-10	♀	1′-3½″	19	20	15	212	63	
5-10-10	♀	2′-6½″	21	21	15	207	68	

No specimen was gravid, but it is probable that the deposition of eggs took place during the months that I was away in the sanatarium at Madaglasht.

Most specimens were of rather a light shade of brown, but one was quite uniform black, the skin and scales alike. There was no suspicion of banding, and no hood marks.

VIPERIDÆ.

Ancistrodon himalayanus (Günther).

At 10,000 feet, up to 12,000 feet, I found this species as common as it is in other parts of the Western Himalayas. I do not think it has been recorded before west of the River Indus. I collected 33 specimens between June and September, 19 of which were ♂♂, and 14 ♀♀.

In my article on this snake in this Journal (Vol. XX, p. 65, et seq.) I remarked upon its very quiet disposition. The many living specimens I had in Chitral, some of which I had for weeks in captivity, serve to confirm my previous observations on its timidity. I encountered several in my walks abroad, and picked them up without one attempting to bite me. I played with several, trying to irritate them to bite, but to no purpose. It sometimes under irritation rubs one coil upon another in a restless fashion, reminding one of the characteristic motion elicited by the saw-scaled viper (*Echis carinata*). More rarely it agitated the tail tip as a demonstration of excitement.

It is difficult to see, when not in motion, its sombre hues harmonising very closely with those of its favorite bed, the needles of the various conifers that flourish about Madaglasht, the commonest of which is the spruce (*Picea morinda*). The silver fir (*Abies webbiana*) and the deodar (*Cedrus lebani* var.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

deodara) are also much in evidence at that elevation (*circa* 10,000 feet). The tongue in life is blackish with whitish tips. The secretion from the anal glands is of a dark-ochraceous colour, usually of the consistency of custard but sometimes inspissated so that it reminded one of pomade hongroise being expressed from a tube. In addition to this secretion, pressure behind the anus will, in a fresh specimen, sometimes eject a very fine jet of a limpid fluid, which is evidently stored in some quantity. I have noticed a similar limpid secretion in some other vipers.

In the annexed table of details it will be seen that the scale rows are normally 21 anteriorly, and 17 behind.

In 4 specimens the scale rows anteriorly were 19 in places, and in all the 4th and 5th rows above the ventrals had fused to reduce the normal number. The resulting scale divided, and the parts again fused, sometimes 3 or 4 times before the normal 21 rows were finally established.

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	Remarks.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
28-6-10...	♂	1′-2¾″	19	21	17	150	39?	A *L. himalayanus* in stomach.
4-7-10...	♀	1′-6⅞″	21	21	17	156	41	A mouse in the stomach.
4-7-10. .	♀	7⅜″	21	21	17	149	36	Two *Scolopendra* in stomach.
4-7-10...	♀	6⅞″	21	21	17	148	38	
5-7-10...	♂	11¾″	21	21	17	151	43	
5-7-10,..	♀	7⅝″	21	21	17	155	35	15 ventrals between anal and the navel.
9-7-10...	♂	1′-3¼″	21	21	17	146	41	
11-7-10...	♀	1′-2½″	19	21	17	?	38	
13-7-10...	♀	1′-9¾″	21	21	17	156	36	
13-7-10...	♂	1′-7¼″	21	21	17	154	38	
13-7-10...	♂	1′-3″	21	21	17	144	40	
13-7-10...	♂	1′-2¾″	21	21	17	152	41	The tails of two *Lygosoma* in stomach.
14-7-10...	♂	1′-4¼″	21	21	17	153	42	A *Lygosoma himalayanus* in the stomach.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Date.	Sex.	Length.	Costals. 2 heads-lengths behind head.	Costals. Midbody.	Costals. 2 heads-lengths before vent.	Ventrals.	Subcaudals.	Remarks.
14-7-10...	♀	1′-8¼″	21	21	17	156	36	A mouse in the stomach.
15-7-10...	♂	1′-2⅝″	21	21	17	152	41	
20-7-10...	♂	1′-3⅜″	21	21	17	150	42	A large *Scolopendrum* in the stomach.
22-7-10...	♂	1′-3¼″	21	21	17	150	43	
23-7-10...	♀	1′-4¼″	21	21	17	153	36	
23-7-10...	♂	1′-3¾″	21	21	17	150	39	A *L. himalayanus* in stomach.
24-7-10...	♂	1′-2½″	21	21	17	149	41	
29-7-10...	♂	1′-3¼″	21	21	17	148	40	A. *L. himalayanus* in stomach.
29-7-10...	♂	1′-2⅝″	21	21	17	154	41	
2-8-10...	♀	1′-8″	21	21	17	157	38	A mouse in the stomach.
5-8-10...	♀	1′-4¼″	21	21	17	153	41	
25-8-10...	♀	1′-8¾″	21	21	17	156	37	
25-8-10...	♀	1′-7⅜″	21	21	17	150?	36	Hair of a small mammal in stomach.
25-8-10...	♂	1′-2½″	21	21	17	?	40	
25-8-10...	♀	1′-5⅛″	21	21	17	158	35	Contained 4 fœtus. 2 ♂♂ and 2 ♀♀, measuring 4 inches in length. The ♂ genitals extruded.
27-8-10...	♀	1′-6″	21	21	17	152	36	3 young in the abdomen, ♂ 5¼″, ♂ 5⅜″ and ♀ 5⅜″.
28-8-10...	♂	1′-5″	21	21	17	151	42	
4-9-10...	♂	1′-3⅝″	21	21	17	152	46	A *L. himalayanus* in the stomach.
4-9-10...	♂	1′-2½″	21	21	17	154	42	
-9-10...	♂	1′-2⅝″	21	21	17	149	44	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BATRACHIA.

ARCIFERA.

Bufonidæ.

Bufo viridis (Laurenti).

This is the common toad in Chitral, and was abundant inside the fort at Drosh in the summer. It was generally abroad at, or after, dusk.

CAUDATA.

Salamandridæ.

A newt occurs in Chitral, but I was unable to identify it. The one specimen I saw had been swallowed by one of the snakes *Tropidonotus tessellatus* captured near Mastuj. The head was a good deal digested, but the rest of the creature was intact.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A LIST OF INDIAN FUNGI, CHIEFLY OF THE BOMBAY PRESIDENCY, WITH THE DESCRIPTION OF TWO NEW SPECIES.

BY

E. BLATTER, S. J.

(*With a plate*).

The following is a list of Hyphomycetes, chiefly Basidiomycetes, which, about a year ago, I had sent to the Rev. F. Theissen, S. J., for identification. This gentleman was obliging enough to take the trouble of naming the specimens which were not always in the best state of preservation. Mr. C. G. Lloyd was so kind as to compare a great part of the Polyporaceæ with the material kept in Kew, and Mr. L. Romell of Stockholm identified several specimens. The Ascomycetes were examined by Dr. H. Rehm, and the Uredinales and Deuteromycetes by Mr. H. Sydow of Berlin. I wish to express my thanks to all who in some way or other lent us their kind help.

Rev. F. Theissen published a list of the fungi in the "Annales Mycologici" (Berlin, 1911, vol. IX, fasc. 2). As only a few, however, of those interested in Indian Botany and, at the same time, residing in this country are in a position to consult that Journal, we consider it advisable to publish the results in these pages. To the species mentioned in the "Annales" we shall add the names of some other fungi, which were collected between 1904 and 1906.

RETICULARIACEÆ.

Reticularia venosa, B. et C.

On dead wood.—In the ravines of Khandala (Western Ghats).—No. 72.

SPHÆRIOIDACEÆ.

Macrophoma Musæ, Berl. et Vogl.

On leaves of *Musa sapientum*, L.—Anand (Gujarat).—No. 85. Collected by Rev. H. Zurhansen, S. J.

Robillarda scutata, Sydow n. sp.

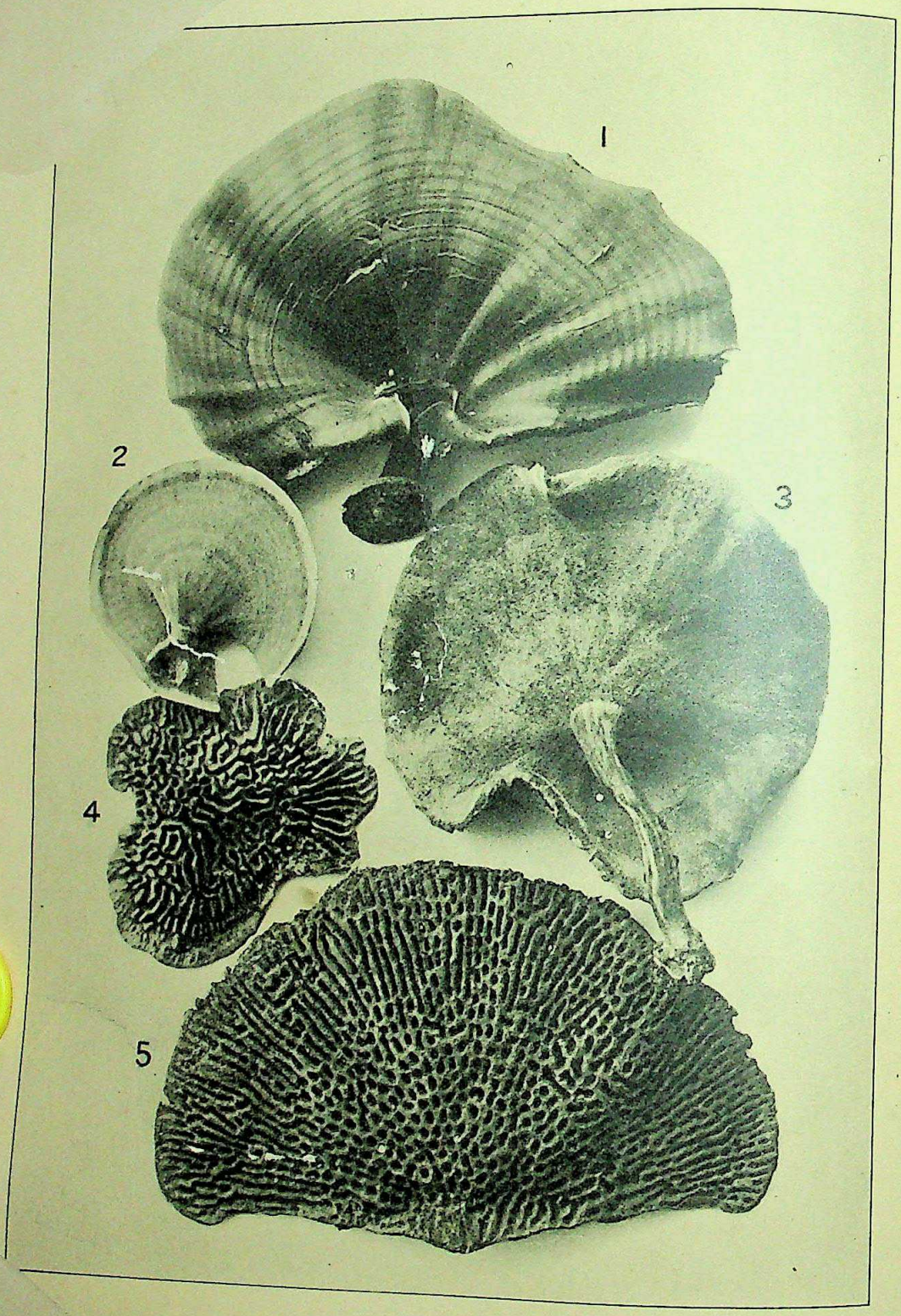
"Pycnidiis amphigenis, sine maculis, sparsis, rotundatis, 200-250 μ diam., atris, lenticularibus vel subdimidiatis, contextu minute celluloso;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



INDIAN FUNGI.

dia. 1. *Polystictus xanthopus* Fr., seen from above.
2. ,, ,, ,, seen from below.
3. Hymenium of *Polyporus umbilicatus* Berk.
Hymenium of *Lenzites ochroleuca* Lév. (lenzitoid form).
,, ,, ,, (polyporoid form near base, passing over into the lenzitoid form near ery).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

sporulis subfusoideis, utrinque acutiusculis, leniter curvulis vel inæquilateris, medio spurie 1-septatis, hyalinis, apice setulas duas hyalinas late divergentes tenues ca. 12-15 μ longas gerentibus, cellula basali interdum caudata, 14-17 $\times$ 2-3 μ; basidiis brevissimis, vix visibilibus.

This species does not represent a typical *Robillarda*, but, in consequence of the flat and almost shield-shaped pycnidia, it must be considered as forming a transition to the *Leptostromataceæ*. We can, nevertheless, class it under the *Sphæropsideæ*, because the pycnidia scarcely show anything of the typical radial structure of the *Leptostromataceæ*."

On dead leaves of *Mimusops hexandra*.—Anand (Gujarat).—No. 83. Discovered by the Rev. H. Zurhausen.

USTILAGINACEÆ.

Ustilago Tritici (Pers.) Jensen.

On wheat.—Anand.—No. 93; Malakwar (Punjab).

UREDINACEÆ.

Aecdium Parvettæ, Klk.

On Pavetta sp. October and November 1906.—Matheran.—No. 161.

AURICULARIACEÆ.

Auricularia polytricha, Mont.

On stems.—Near Kanheri Caves (Salsette).—No. 170 and 102.

Auricularia mesenterica, (Dicks.) Fr.

On dead wood.—Bandora; Khandala.—No. 81.

Auricularia sambucina, Mart.

On stems.—Khandala (Western Ghats).—No. 100.

DACRYOMYTACEÆ.

Dacryopsis sp.

Sporophores densely arranged, simple, cartilaginous, reddish-yellow, 1, 5 mm. high. Stem 1, 2 mm. high, red at the base, 350 μ in diameter, upwards lighter, 250 μ in diameter. Capitulum spherical, 0, 5 mm. in diameter, red. Sterile.

On bark.—Mount Pedro (Ceylon).—April 1909.—No. 171.

THELEPHORACEÆ.

Corticium cfr. cœruleum (Schrad.) Fr.

Khandala (Western Ghats).—No. 69.

Stereum hirsutum (Willd.) Fr.

On stems.—Khandala.—No. 157.—Dehra Dun, U. P.—No. 8.

Stereum elegans, Mey.

On wood.—Khandala.—No. 78 and 88.

Stereum lobatum, Fr. forma.

On stems.—Khandala.—No. 8.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Stereum annosum, B. et Br.—Khandala.

Hymenochæte strigosa, B. et Br.

On bark.—Khandala.—No. 106.

HYDNACEÆ.

Irpex flavus, Kl. (*Polystictus flavus,* Jungh.)

On branches of trees.—Khandala. No. 4 and 66.—Salsette.—No. 136 and 141.—(Has also been found in Africa, Ceylon, Java, Samoa, Australia.)

Irpex vellereus, B. et Br.

On wood.—Khandala.—No. 98.

Irpex canescens, Fr.

On wood.—Khandala.—No. 67 and 68.

POLYPORACEÆ.

Ganoderma applanatum (Pers.) Wallr.

On stems —Khandala.—No. 159.—(Cosmopolitan).

Ganoderma lucidum (Leys.) Fr.

On stems.—Victoria Gardens, Bombay.—No. 121.

Ganoderma resinaceum (Bod).

Pileus up to 12 cm. broad, Pores 4-5 to 1 mm, whitish, later on brown, 8-10 mm. long. As regards texture, colour, crust, and spores fully identical with the European *Ganoderma lucidum* and, according to Mr. Lloyd's notes, only a stipeless form of the latter. Pileus laterally attached, with or without concentric sulcate zones.

On old stem.—Andheri (Salsette).—No. 154.—Bandora.—No. 51.

Polyporus isidioides, Berk.=*P. gilvus,* Schw.

This is not the Typical *Gilvus*-form, but cannot, according to Mr. Lloyd, be separated from it. The pileus of Father Theissen's Brazilian type specimens are light brown, radially furrowed, passing into yellow towards the margin; the margin itself is sharp, not bordered.

In the Indian specimens the surface is of a siena shade with transitions into darkbrown; the zones are concentric and the margin rounded, borderlike and golden yellow. As to texture, pores, etc., they agree perfectly with *P. gilvus.*

On dead stems.—Khandala.—No. 75 and 160.

Polyporus cubensis, Mont.

According to Mr. Romell scarcely different. Pileus thin, half-circular, wood-coloured, concentrically furrowed in the peripheric half, crossed by radiating furrows; in the central part smooth, clay-coloured. Pores darker, roundish, ca. 5 to 1 mm.; sterile margin narrow, lighter.

On wood.—Dehra Dun, U. P.—No. 142.

Polyporus Persoonii, Fr. forma.

Pilei 3-5 cm. in circumference, imbricate, or one parallel behind the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

other, reflex, sometimes resupinate; pores sometimes lenzitoid, running in different ways.

As to the other characters fully agreeing with Father Theissen's Brazilian specimens.

On dead stems.—Andheri (Salsette).—No. 131 and 132.

Polyporus umbilicatus, Berk.

According to Mr. Lloyd approaching the European *P. lepideus* Fr. Pilei 3-6 cm. in circumference, often grown together, but the stipes free. Stipe central, 4-5 cm. long, 2-3 mm. in diameter, reaching almost 5 mm. towards the upper end, smooth. Pores 4 to 1 mm.

On Wood.—Compound of St. Xavier's College, Bombay.—No. 116 and 151.

Polyporus aff. grammocephalus, Berk.

According to Mr. Lloyd different as to the way of growing, otherwise closely allied to grammocephalus. The differences between the specimens of Ule's *Mycotheca brasiliensis* and the Indian specimens are considerable. Pileus fan-shaped or semicircular, 3-6 cm. in circumference, with a short stout stipe. Pileus 4 mm. thick, of which 1-15 mm. belong to the hymenium. Upper surface pretty rough. Pores ca $2\frac{1}{2}$—3 to 1 mm., (in Ule's specimens 6).

On stems.—Poona.—Aug. 1906.—No. 162.

Polystictus russogramme, Berk.

On wood.—Khandala.—No. 115.

Polystictus occidentalis, Kl. f. *resupinata*.

On decaying wood.—Bandora.—No. 9.

Polystictus occidentalis Kl. f. tenuis.

"Ad *P. gibberulosum* valde accedens, nisi idem." (Romell).

On branches.—Bombay.—Aug. 1908.—No. 166.

Polystictus floridanus, Berk, forma.

Differs slightly by the brownish-red colour of the hymenium.

On wood.—Dehra Dun.—No. 173.

Polystictus zonatus (Koen.), Berk.

On branches.—Bombay.—Aug. 1908.—No. 164.

Polystictus sanguineus (L.), Mey.

On stems.—Dehra Dun.

Polystictus leoninus, Kl.

On stems.—Anand (Gujarat).—No. 82.—(Collected by Rev. H. Zurhausen).

Polystictus zeylanicus, Berk.

On branches.—Khandala.—No. 76.

Polystictus xanthopus, Fr.

On stems.—Simla.—April 1907.—No. 124 and 148.

No. 124: Pileus $3\frac{1}{2}$ cm. in diameter, O, 5 mm. thick, reddish-yellow, with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

broad dark red concentric zones; stipe central; pores greyish-white, 5-6 to 1 mm. Sterile margin 1 mm. broad, white.

No. 148: Pileus semicircular, 8 cm. in diameter, dark golden yellow, with many narrow zones of almost the same colour; stipe almost lateral; pores dark bluish-grey, 4-5 to 1 mm. Sterile margin 2-2½ mm. broad, wood-coloured.

Grevillea, vol. 14, p. 78, gives the following synonyms: *P. crassipes* Curr., *P. Cupreonitens*, Kalchb., and vol. 15, p. 56: *P. Katui*, Ehr. This species is widely distributed in Australia and Africa (cf. Torrend in 'Broteria,' 1905, p. 218).

Polystictus ? senex, Mont.

'Forma junior, crassior, obtusa, azona' (Romell.)

On old stem.—Compound St. Xavier's College, Bombay.—Oct. 1907—No. 146.

Polystictus sarawacensis, Berk—Khandala.

Hexagona tenuis, Hook.

On wood.—Khandala (Western Ghats)—April 1907—No. 157—Bassein—Sept. 1907—No. 135 and 137.

Different forms; pores 5-9 to 5 mm.; zones of pileus sometimes almost disappearing.

Hexagona polygramma, Mont.

On wood.—Khandala (Western Ghats).—No. 152.

Large-pored form of *H. tenuis*. (cf. Lloyd, Synopsis 1910); Pores 3 to 5 mm.

Lenzites ochroleuca, Lév.

(Hexagona glabra Lév., cf. Lloyd, Synopsis 1910, p. 31.)

On stems.—Bombay, Aug. 1908, No. 163—Khandala, No. 56 and 150.

Various hymenial forms. *Dædalea aulacophylla*, Berk. Salsette, No. 52.

The faint zones disappear sometimes entirely.

Lenzites repanda Pers.

On stems.—Dehra Dun, U. P., No. 155—Simla, No. 134.

In the latter form storeyed arrangement of the pilei. In the first the pileus with central stipe.

No. 150 represents a form which differs by the umbrine, much-zoned upper side of the pileus; as to the other characters it agrees with the type. Perhaps another species?

AGARICACEÆ.

Marasmius spaniophyllus, Berk.

On branches.—Khandala (Western Ghats).—No. 59.

Xerotus lateritius, B. et C.

On dead branches.—Khandala.—No. 145, 127.

According to Mr. Lloyd probably identical with *Xerotus nigritus*, Fr.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

[*Anthracophyllum nigritum* (Lév.) Kalch.] The same species was found several times in Brazil by Father Theissen.

(Occurs in North America, Cuba, South America, Australia.)

Xerotus griseus, Berk.—Khandala.

Schizophyllum alneum, (L.) Schröt.

On dead wood.—Poona, No. 172—Bombay, No. 57 and 164.

Lentinus aff. subnudus, B.

On dead stem.—Khandala (Western Ghats).—No. 147.

'Ex specim. Kew valde affines videntur *L. subnudus, cæspitosus, Curreyanus, manipularis, multiformis,* et porte omnes ad *L. cretaceum* ducendi.' (Romell).

Pileus up to 9 cm in circumference. Scales well developed in the centre of the upper surface of the pileus, but gradually disappearing towards the periphery. Lamellæ very narrow, ca. 2½ mm. broad, with sharp edge. Stipe 4-12 mm. in diameter, seems to have been covered with scales. All the pilei of the dried specimens show deep depression in the centre. Original colour not known. Pileus and lamellæ straw-coloured; stipe lighter. Edge of lamellæ with a brown shade.

Collybia stipitaria, Fr.

On wood.—Simla, April, 1907.

Lepiota sordescens, B. et C.

On the ground.—Salsette.—No. 54.

Lepiota Badhami, Berk.—Thana.—No. 162.

Spores white, broadly-elliptical, 8-9 ⋁ 6-7 μ.

PHALLACEÆ.

Dietyophora phalloidea, Desv.

On the ground.—Khandala.

HELVELLACEÆ.

Morchella conica, Pers.

On the ground.—Dehra Dun, U. P.—No. 95.

Spores 26-28 ⋁ 12-14 μ with thin mucous coate, elliptical rounded, uniseriate. Asci 16-20 μ broad. Paraphyses club-shaped.

HELOTIACEÆ.

Sarcoscypha sp.

On the ground.—Khandala.—No. 120.

There were only two sterile specimens preserved in alcohol and it was, therefor, impossible to distinguish the species.

Mr. Rehm makes the following remarks: "Hymenium totally undeveloped; even the youngest specimens show beautiful hairs, which are long, colourless, almost entirely thickwalled, scarcely showing a furrow in the interior, unseptate and pointed.—Approaches *Sarcoscypha Racoitzæ*, Bemm. Rouss. (Sacc. XVI, 713), but, taking their description, cannot be identical

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with it ; the following show similar relationships : *Peziza aluticolor*, Berk. [= *Sarcoscypha Colensoi*, Berk.=*Sarcoscypha melanopora*, B. et C. = *Peziza lachnoderma*, Berk. (sec. Massee, Linn. Soc. 31, p. 504)], *Peziza semitosta*, B. et C. [= *Peziza Hainesii*, Ell. =*Macropodia semitosta*, Sacc. VIII, 159 (cf. Durand, Journ. Myc. XII, p. 31)]."

AMPHISPHÆRIACEÆ.

Amphisphaeria khandalensis, Rehm n. sp.

Perithecia applanato-globosa, parum immersa cortice velut annulo denigrato breviter cincta, lævia, nigra, papillâ obtusâ instructa, ca. 700 μ diam. Asci fusiformes, p. sp. 120-150 8-9 μ (sporidiis 2-3-stichis) usque 200 ⋁ 5-6 (sporidiis monostichis). Paraphyses densissimæ, hyalinæ, simplices flexuosæ, Sporæ fusoideæ, utrinque aciculares, fuscæ, 1-septatæ, ad septum vix constrictæ, typice ex utraque septi parte guttulâ unâ contiguâ præditæ, 42-52 ⋁ $4\frac{1}{2}$-5 μ.

On bamboos.—Khandala (Western Ghats).—Oct. 1906.

"Approaches *Amphisphæria Edamensis*, P. Henn. (Sacc. Syll. XVI, p. 506), which, however, has got "sporas 50-65 ⋁ 9-10 μ, medio constrictas." *Amph. botulispora* (Cke.) (Syll. I. p. 719), too, has larger and broader spores, the cells of which are unequal." (Rehm).

XYLARIACEÆ.

Xylaria dealbata, B. et Br.

On wood.—Khandala.—No. 108.

Xylaria piperiformis, Berk.

On wood.—Bombay.—No. 110.

Hypoxylon vividum, B. et. Br.

Stroma pulvinato-effusum, rubro-cinnabarinum, margine lætiore miniato, vix 2 mm. crassum, fere totum peritheciis constans, stromate ferrugineo basilari parco, contextu fumoso-nigro molliusculo, extus verticibus subpromimentibus nitide leniter colliculosum, haud nitens. Perithecia oblonga erecta, 1500-1800 μ altis, 300-400 μ latis, basin versus usque 250 μ attenuatis, ostiolo minuto pertuso. Ascis cylindraceis, apice rotundatis, p. sp. 100-200 ⋁ 8-9 μ, desuper in pedicellum delicatum, usque 150 μ longam attenuatis. Sporæ recte vel oblique monostichæ, ellipticæ vel planoconvexæ, obscure brunneæ, continuæ, pluriguttulatæ, 15—18 ⋁ 7—8 μ. Paraphyses longissimæ, hyalinæ, filiformes, simplices, 1—1, 5 μ cr.

On bark.—Bombay, 1907.—No. 122.

Camillea bacillum, Mont.

On bark.—Khandala (Western Ghats).—No. 58.

Daldnia concentrica (Bolt.), Ces. et DN.

On stem.—Andheri (Salsette).—No. 112 and 133.

Spores dark brown, mostly plano-convex, 12—15 ⋁ 5—6 μ.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON THE BIRDS OF SEHORE, CENTRAL INDIA, WITH SPECIAL REFERENCE TO MIGRATION.

BY

CAPTAIN C. H. T. WHITEHEAD.

Sehore is a small cantonment in Bhopal State on the plateau of Central India. It is situated in a slight hollow surrounded by mango groves and gardens on the bank of the Siwan Nullah and three miles west of a low ridge (about 100 feet high) which divides the waters of Bengal and Bombay.

The surrounding country is gently undulating, broken by occasional rocky outcrops (the highest of which only rises about 450 feet above the plain), and covered for the most part with thin scrub and grass, except to the south, where, 6 miles out, jungle averaging some 15 to 20 feet in height commences, stretching thence to the Vindhyas. In this tract Her Highness the Begum of Bhopal has generously set apart a tiger preserve, known as Lotia, for the Europeans of Sehore, the Kolar River drains it, and this is a paradise for many interesting forest birds.

The soil is a stiff black cotton one and cultivation is not very extensive, except in the more favoured parts, *e.g.*, around Sehore and Ashta. Several small streams run through the District, but there are few tanks except the Big Lake at Bhopal, 20 miles east, the series of small ones around Akodia 40 miles west, and Ashta 27 miles south-west; fortunately the two former are easily accessible by railway, and the first with its gently shelving shore and excellent feeding appears to be specially attractive to waterfowl, judging by their very late stay there.

August is the only month in which I did not visit the Bhopal Lake. From 20th of February till the 31st of July I visited it practically every week.

The annual rainfall averages roughly 50 inches, and mostly occurs between the 20th of June and the 30th of September. The climate, owing to the altitude—some 1,700 feet—and the absence of rock near the surface, is comparatively cool and in winter there are usually slight frosts.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Instead of just giving a list of the birds, I have divided them into groups in accordance with Mr. Kinnear's Migration Circular as under :—

I.—True Migrants, these number ...	70	(122)
II.—Migrants	32	(80)
III.—Partial Migrants	38	(39)
IV.—Residents	141	(78)
V.—Doubtful, whether Migrants or not.	13	(23)
Total...	294	Total... (342)

The figures in brackets are the corresponding ones for the Kohat District, N.-W. F. P.; these show what a much larger proportion of the birds of the N.-W. are migrants.

The total number of species collected and observed is 294, but the list is far from exhaustive (especially as regards forest birds), as I did not have too much spare time to devote to birds during my stay at Sehore (April 1908 to August 1910.)

The chief points which have struck me are as follows :—

1. The extraordinarily late stay of migratory waterfowl.
2. How certain common birds generally considered resident entirely disappear during the monsoon, and how certain others only appear at that season.
3. That some species judging by the records of previous observers are extending their ranges, *e. g.*, *Lusciniola melanopogon*, *Merula atrigularis*, *Anthus richardi*, *Emberiza stewarti*.

All references are to Oates' and Blanford's "Fauna of British India Birds" (abbreviated O. & B.). The numbers before the scientific names are those used in that work.

Unless noted to the contrary none of any species were observed between the date of departure and that of arrival, but except where otherwise stated they remained present between the dates of arrival and departure, *i.e.*, were not merely birds of passage.

My best thanks are due to Major H. A. F. Magrath for kindly correcting the manuscript and to Mr. Ogilvie Grant for promptly, verifying in the British Museum my identifications of specimens collected.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I.—TRUE MIGRANTS.

	Date of Arrival.	Date of Departure.
362. LOCUSTELLA STRAMINEA, The Turkestan Grasshopper Warbler. Put up several in long grass on January 16th and shot one	....	Jan. 16
367. ACROCEPHALUS AGRICOLA, The Paddy Field Warbler. Common in reed beds all winter ..	Nov.	Apr. 17
377. LUSCINIOLA MELANOPOGON, The moustached Sedge Warbler. Fairly common in reed beds.	Dec.	Mar. 6
407. PHYLLOSCOPUS TRISTIS, The Brown Willow Warbler. Common	Nov. 22	Apr. 7
408. PHYLLOSCOPUS INDICUS, The Olivacous Willow Warbler. Rather scarce, usually seen singly or in pairs, but on 3rd April I saw about twelve in one bush. Though unlike a typical *Phylloscopus* in habits (*vide* Oates and Blanford), still it closely resembles *P. tickelli* in notes and habits as well as in colouring, and it is its note which generally leads to its discovery	Oct. 25	Apr. 3
420. ACANTHOPNEUSTE NITIDUS, The Green Willow Warbler. Common until the end of October, not noted later, or in spring	Sept. 20	....
479. LANIUS ISABELLINUS, The Pale Brown Shrike. Rather scarce	Nov.	Mar. 6
481. LANIUS CRISTATUS, The Brown Shrike. A fairly common winter visitor, date of departure not noted	Oct. 18.	....
528. PASTOR ROSEUS, The Rosy Pastor. Common, large flocks pour in as the jowari ripens towards the end of November	Oct. 17	May 5
532. STURNUS MENZBIERI, The Indian Starling. Saw one flock on the 12th of December 1908, that is all	....	....
561. SIPHIA PARVA, The European Red-breasted Flycatcher. Abundant	Sept. 28	Apr. 15
620. SAXICOLA OPISTHOLEUCA, Stricklands Chat. Common	Oct. 3	Mar. 28
625. SAXICOLA ISABELLINA, The Isabelline Chat. Common during their stay, date of departure not noted, but certainly common up till January 16th.	Nov. 7	Jan. 16
626. SAXICOLA DESERTI, The Desert Chat. Same as No. 625	Nov. 2	Jan. 16

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Date of Arrival.	Date of Departure.
642. CYANECULA SUECICA, The Blue Throat. Common but chiefly in reed beds	Oct. 14	Apr. 7
677. MERULA ATRIGULARIS, Black-throated Thrush. Only one seen (this is now in the British Museum)	Dec. 12	....
795. EMBERIZA BUCHANANI, The Grey-necked Bunting. Common in scrub	Oct. 10	Apr. 28
800. EMBERIZA LUTEOLA, The Red-headed Bunting. Common probably arrived much earlier.	Nov. 24	Apr. 3
826. MOTACILLA ALBA, The White Wagtail. Common, stays well in to April I believe	Sept. 30	Mar. 13
833. MOTACILLA BOREALIS, The Grey-headed Wagtail. Arrival not noted but flocks of immature yellow wagtails arrived in last week in September. Only common in March and April	....	May 1
835. MOTACILLA BEEMA, The Indian Blue-headed Wagtail. Same as 833	....	May 1
836. MOTACILLA FELDEGGI, The Black-headed Wagtail. Not very common	Nov. 15	Mar. 23
837. MOTACILLA CITREOLA, The Yellow-headed Wagtail. Abundant about the reed beds and marshes	Sept. 28	Apr. 17
840. ANTHUS TRIVIALIS, The Tree Pipit. Abundant. *A. maculatus* propably also occurs, but without shooting they are difficult to distinguish from *A. trivialis*	Sept. 20	Apr. 21
845. ANTHUS RICHARDI, Richard's Pipit. Only one met with (this is now in the British Museum). Perhaps overlooked owing to its close resemblance to the next species	....	May 22
846. ANTHUS STRIOLATUS, Blyth's Pipit. Fairly common in cold weather. Departure not noted	Sept. 6	....
848. ANTHUS CAMPESTRIS, The Tawny Pipit. Fairly common	Oct. 10	Apr. 3
862. CALANDRELLA BRACYDACTYLA, The Short-toed Lark. Abundant on uncultivated lands ..	Nov. 7	Mar. 25
1189. PANDION HALIAETUS, The Osprey. Not common. Date of departure not noted	Oct. 25	....
1233. CIRCUS MACRURUS, The Pale Harrier. Common	Sept. 23	Apr. 17

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Date of Arrival.	Date of Departure.
1237. CIRCUS AERUGINOSUS, The Marsh Harrier. Very common. Harriers are not supposed to perch, but this species is frequently to be seen perched on dead bushes about the Bhopal marsh.	Oct. 7	May 14
1241. BUTEO DESERTORUM, The Common Buzzard. A scarce winter visitor, dates of arrival and departure not noted	....	....
1254. FALCO PEREGRINUS, The Peregrine Falcon. Occasionally seen about jheels and tanks ..	Dec. 28	Feb. 20
1350. COTURNIX COMMUNIS, The Grey Quail. Common chiefly around jheels. Probably arrives much earlier and departs later than the dates given.	Nov. 7	Mar. 6
1393. PORZANA PUSILLA, The Eastern Ballon's Crake. Apparently not common	....	Apr. 21
1394. PORZANA MARUETTA, The Spotted Crake. Only two or three observed but possibly fairly common	Nov. 10	Feb. 27
1407. GRUS COMMUNIS, The Common Crane. Scarce. Not observed on migration	....	....
1411. ANTHROPOIDES VIRGO, The Demoiselle Crane. A flock of about 100 frequented the Bhopal Jheel for a month in the spring	....	Mar. 20
1438. CHETTUSIA LEUCURA, The White-tailed Plover. Common about marshes	Oct. 7	Mar. 20
1454. NUMENIUS ARQUATA, The Curlew. Rather scarce	Nov. 7	Apr. 10
1455. NUMENIUS PHÆOPS, The Whimbrel. Only observed on these two dates, a single one each time	July. 13	May 22
1456. LIMOSA BELGICA, The Black-tailed Godwit. Occurs in big flocks in spring and autumn—the majority depart early in May but there were still four on the Bhopal lake on June 12	Oct. 25	June 12
1461. TOTANUS GLAREOLA, The Wood Sandpiper. Present throughout the year, though none I think breed—scarcest in July, but even in July from thirty to fifty remain	....	....
1462. TOTANUS OCHROPUS, The Green Sandpiper. Abundant	July 31	June 23
1463. TOTANUS STAGNATILIS, The March Sandpiper. Not common. Date of arrival not noted.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Date of Arrival.	Date of Departure.
Only occurs in autumn and spring. Three stayed on till July 3rd	....	July 3
1403. TOTANUS CALIDRIS, The Redshank. Common. Three had returned by July 24th and several more by the 31st	July 24	Apr. 10
1465. TOTANUS FUSCUS, The Dusky Redshank. Common	Sept. 24	May 1
1466. TOTANUS GLOTTIS, The Greenshank. At least two pairs stayed up till July 31st (the date of my last visit) and probably did not migrate at all. Cannot say whether they nested—they certainly paired	Oct. 7	July 31
1468. PAVONCELLA PUGNAX, The Ruff. Common, had returned by 31st July	July 31	Apr. 17
1471. TRINGA MINUTA, The Little Stint. Common but chiefly in spring and autumn. Plentiful up to date of departure	Sept. 24	May 22
1474. TRINGA TEMMINCKI. Temminck's Stint. Same as No. 1471.	Sept. 26	June 5
1478. TRINGA ALPINA. The Dunlin. Common	Sept. 26	....
1484. GALLINAGO CŒLESTIS. The Common Snipe. Common from Oct. 7th up till Apr. 17th	Oct. 7	May 1
1485. GALLINAGO STENURA, The Pintail Snipe. Always looked out for it when shooting, but only Saw two which were both shot on 13th January ..	....	....
1487. GALLINAGO GALLINULA, The Jack Snipe. Common but less so than 1484	Oct. 7	Mar. 13
1496. HYDROCHELIDON HYBRIDA, The Whiskered Tern. Scarce—observed single birds on these two dates only..	Sept. 3	June 12
1550. LEPTOPTILUS DUBIUS, Adjuant. Common from May till August at least..	May 14	....
1574. BOTAURUS STELLARIS, The Common Bittern. Fairly common in reed beds	Nov. 21	Apr. 10
1579. ANSER FERUS, The Grey Lag Goose. Reported to be common along the Nerbudda. Not personally observed	....	....
1583. ANSER INDICUS, The Barred-headed Goose. Not common but flocks seen on Bhopal and Akodia jheels	Oct. 25	....

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Date of Arrival.	Date of Departure.
1588. CASARCA RUTILA, The Brahminy Duck. Fortunately not very common	Oct. 31	....
1595. CHAULELASMUS STREPERUS. The Gadwall. Common up till May 1st, and I believe later.	Nov. 10	May 1
1599. MARECCA PENELOPE. The Wigeon. Not very common	Oct. 7	May 1
1600. DAFILA ACUTA, The Pintail. Very common. The majority left in March and April, but a flock varying from six to twenty remained on through May and till 12th June	Oct. 25	June 12
1601. QUERQUEDECULA CIRCIA, The Garganey Teal. Very common in autumn and spring. More than a hundred remained on Bhopal lake till the end of June. Three pairs and one odd one remained, stayed throughout July (still there on 31st the last time I visited the lake). One shot (skin preserved) on July 2nd	Oct. 7	July 31
1602. SPATULA CLYPEATA, The Shoveller. Common up till the end of April. One pair at least stayed till June 12th	Oct. 27	June 12
1604. NETTA RUFINA, The Red-headed Pochard. Common. Probably arrives much earlier..	Dec. 5	Mar. 20
1605. NYROCA FERRINA, The Common Pochard. Common	Nov. 21	Mar. 30
1609. NYROCA FULIGULA, The Tufted Duck. Common till April—8 stayed in Bhopal Lake till May 1st and 1 pair was constantly seen till July 31st	Nov. 10	July 31

II.—MIGRANTS.

363. ACROCEPHALUS STENTOREUS, The Indian Great Reed Warbler. Common in November, December and April—not seen between December and April	Nov. 10	Apr. 21
365. ACROCEPHALUS DUMETORUM, Blyth's Reed Warbler. Common till the end of October, especially in gardens—not noted in spring ..	Sep. 20	....
395. HYPOLAIS RAMA, Syke's Tree-Warbler. Common till mid-November and again in February and March	Oct. 7	Apr. 14
396. HYPOLAIS CALIGATA, The Booted Tree-Warbler. Same as 395	Oct. 7	Mar. 25

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Date of Arrival.	Date of Departure.
399. SYLVIA JERDONI, The Eastern Orphean Warbler. Fairly common in March	....	Mar. 25
402. SYLVIA AFFINIS, The Indian Lesser White-throated Warbler. Very common up till the end of March	Oct. 10	Apr. 21
418. PHYLLOSCOPUS HUMII, Hume's Willow-Warbler. Same as 402	Sept. 20	Apr. 6
422. ACANTHOPNEUSTE VIRIDANUS, The Greenish Willow-Warbler. Common	Oct. 9	Mar. 17
428. ACANTHOPNEUSTE OCCIPITALIS, The Large Crowned Willow-Warbler. Fairly common ..	Sept. 28	Mar. 11
495 PERICROCOTUS BREVIROSTRIS, The Short-billed Minivet. Seen occasionally in winter but scarce	....	....
510. PRATINCOLA MAURA, The Indian Bush-Chat. Common especially on migration	Sept. 12	Apr. 17
618. SAXICOLA PICATA, The Pied Chat. Only twice seen	Oct. 18	....
644. RUTICILLA RUFIVENTRIS, The Indian Redstart. Very common	Sept. 19	Apr. 15
693. PETROPHILA CYANUS, The Western Blue Rock-Thrush. Fairly common.	Nov. 9	Mar. 23
761. CARPODACUS ERYTHRINUS, The Common Rose-Finch. Fairly common particularly in March and April	Oct. 14	Apr. 14
793. EMBERIZA STEWARTI, The White-Capped Bunting. Quite common in January in open grassy jungle	....	....
804. CHELIDON URBICA, The Martin. Only one pair seen	....	May 13
808. COTILE RIPARIA, The European Sand-Martin. Common in winter about marshes and tanks	....	Mar. 1
813. HIRUNDO RUSTICA, The European Swallow. Fairly common up till the end of April, an adult seen on May 22nd	Oct. 7	May 22
829. MOTACILLA PERSONATA, The Masked Wagtail. Abundant	Sept. 26	Apr. 1
832. MOTACILLA MELANOPE, The Grey Wagtail. Abundant	Sept. 20	Apr. 28
844. ANTHUS SIMILIS, The Brown Rock-Pipit. Fairly common all winter	Oct. 24	....

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Date of Arrival.	Date of Departure.
1003. IYNX TORQUILLA, The Common Wryneck. Rather scarce	Oct. 17	Mar. 26
1028. MEROPS PERSICUS, The Blue-Cheeked Bee-eater. Occurred in huge flocks from the 7th to the end of October 1909 in company with *M. philippinus* about Bhopal Jheel	Oct. 7	....
1066. UPUPA EPOPS, The European Hoopoe. Common in winter	....	Apr. 7
1104. CUCULUS CANORUS, The European Cuckoo. Fairly common in summer	May 18	July 31
1265. TINNUNCULUS ALAUDARIUS, The Kestrel. Very common	Sept. 24	Apr. 1
1305. TURTUR FERRAGO, The Indian Turtle-Dove. Scarce up till March, but very common all March and up to 20th April..	Nov. 7	Apr. 20
1446. ÆGIALITIS ALEXANDRINA, The Kentish-Plover. Fairly common—2 pairs observed in breeding plumage on May 1st	Sept. 19	May 1
1460. TOTANUS HYPOLEUCUS, The Common Sandpiper. Common	Sept. 3	May 2
1606. NYROCA FERRUGINEA, The White-eyed Duck. Common up till May and there were still four on the Bhopal lake on June 5th	Oct. 15	June 5

III.—PARTIAL MIGRANTS.

508. CAMPOPHAGA SYKESI, The Black-headed Cuckoo-Shrike. A monsoon visitor, very common in the jungle where it nests	June 14	....
518. ORIOLUS KUNDOO, The Indian Oriole. Very common in summer, the majority leave early in October. A very few stay the winter	Mar. 1	Oct. 10
555. STURNOPASTOR CONTRA, The Pied Myna. Common in winter about jheels and up till mid-May	Oct. 23	May 19
568. CYORNIS SUPERCILLIARIS, The White-browned blue Flycatcher. Only seen in March ..	....	Mar. 20
579. STOPAROLA MELANOPS, The Verditer Flycatcher. Rather scarce..	Nov. 10	Mar. 20
588. ALSEONAX LATIROSTRIS, The Brown Flycatcher. Common in the jungle, nests freely. Its habit of constantly depressing its tail makes		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Date of Arrival.	Date of Departure.
recognition easy in spite of nondescript colour, probably stays much later	Apr. 15	Aug. 8
592. CULICICAPA CEYLONENSIS, The Grey-headed Flycatcher. Abundant	Nov. 12	Mar. 11
598. TERPSIPHONE PARADISI, The Indian Paradise Flycatcher. A fairly common summer visitor especially along wooded streams	Apr. 15	Oct. 5
775. GYMNORHIS FLAVICOLLIS, The Yellow-throated Sparrow. Abundant up till June. Nests in March, April and May. *Entirely* disappear in the rains	Oct. 20	June 16
869. MIRAFRA CANTILLANS, The Singing Bush-lark. Common in winter but vanishes in the rains.	Oct. 10	May 30
877. AMMOMANES PHOENICURA, The Rufous-tailed Finch-Lark. Abundant till June. Nests in crevices in the black cotton soil in March, April and May. None seen in the rains..	Sept. 26	June 16
879. PYRRHULAUDA GRISEA, The Ashy-crowned Finch-Lark. Another very common lark till the rains but a very few stay on through July. Nests in April and again in September	Aug. 12	June 14
1026. MEROPS VIRIDIS, The Common Indian Bee-eater. Abundant, except in the rains, and then it is only found in small parties in the jungle and along wooded nullahs	Sept. 20	June 16
1027. MEROPS PHILIPPINUS, The Blue-tailed Bee-eater. Occurred in great flocks over the Bhopal jheel in company with *M. persicus* in October 1909	Oct. 7	Nov. 21
1109. HIEROCOCCYX VARIUS, The Common Hawk-cuckoo. A common monsoon visitor ..	June 20	Oct. 21
1118. COCCYSTES JACOBINUS, The Pied Crested Cuckoo. Abundant during the monsoon	June 5	Oct. 13
1120. EUDYNAMIS HONORATA, The Indian Koel. Only too common up till October. One also noted on December 2nd, another on February 19th ..	Mar. 24	Oct. 14
1321. PTEROCLURUS EXUSTUS, The Common Sand-grouse. Abundant till June. Nests in March, April and May	Oct. 4	July 2
1402. GALLINULA CHLOROPUS, The Moorhen, common	Nov. 6	Apr. 21

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Date of Arrival.	Date of Departure.
1405. FULICA ATRA, The Coot. Abundant till the rains. There were still 30 on July 3rd, only 4 on 10th July and 2 on 31st	Oct. 24	July 31
1422. CURSORIUS COROMANDELICUS, The Indian Courser. The same as 1405, but none seen after July 16th	Oct. 5	July 16
1425. GLAREOLA ORIENTALIS, The large Indian Pratincole. Common around the Bhopal Lake. Probably arrives much earlier and departs later.	May 1	July 24
1451. HIMANTOPUS CANDIDUS, The Black-winged Stilt. Abundant up till July	Sept. 26	July 3
1523. PELECANUS PHILIPPENSIS, The Spotted-billed Pelican. Common on the Bhopal Lake between these dates	June 23	July 24
1528. PHALACROCORAX JAVANICUS, The Little Cormorant. Abundant till July in which month it gradually disappears	Oct. 25	July 31
1529. PLOTUS MELANOGASTER, The Darter. Common till the break of the monsoon	Oct. 7	June 23
1541. IBIS MELANOCEPHALA, The Sacred Ibis. Same as 1529	Oct. 25	June 6
1544. PLEGADIS FALCINELLUS, The Glossy Ibis. Same as 1529	Oct. 25	June 6
1549. XENORHYNCHUS ASIATICUS, The Black-necked Stork. Common on the Bhopal Jheel ..	Jan. 20	July 31
1584. SARCIDIORNIS MELANONOTUS, The Comb Duck. Common	Nov. 10	July 10
1591. NETTOPUS COROMANDELIANUS, The Cotton Teal. Very common in places	Nov. 28	July 31

IV.—RESIDENTS.

4. CORVUS MACRORHYNCHUS, The Jungle Crow. Abundant. Winter visitor only to plains of N.-W. F. P.

7. CORVUS SPLENDENS, The Indian House-Crow. Abundant.

16. DENDROCITTA RUFA, The Indian Tree-pie. Common especially in jungle.

31. PARUS ATRICEPS, The Indian Grey Tit. Common in the jungle, not seen outside.

43. MACHLOLOPUS HAPLONOTUS, The Southern Yellow Tit. Common wherever trees.

105. ARGYA CAUDATA, The Common Babbler.
107. ARGYA MALCOLMI, The large Grey Babbler. } Common in scrub.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

110. CRATEROPUS CANORUS, The Jungle Babbler. Common everywhere, especially in gardens.

135. DUMETIA HYPERYTHRA, The Rufous-bellied Babbler. Fairly common.

139. PYCTORHIS SINENSIS, The Yellow-eyed Babbler. Fairly common.

226. ZOSTEROPS PALPEBROSA, The Indian White-eye. Abundant.

243. ÆGITHINA TIPHIA, The Common Iora. Abundant wherever trees.

278. MOLPASTES HÆMORRHOUS, The Madras Red-vented Bulbul. Abundant everywhere.

327. DICRURUS ATER, The Black Drongo. Abundant. Summer visitor only to N.-W. F. P.

328. DICRURUS LONGICAUDATUS, The Indian Ashy Drongo. Common especially in jungle.

330. DICRURUS CÆRULESCENS, The White-bellied Drongo. Fairly common in some parts of the jungle and twice seen in gardens.

340. DISSEMURUS PARADISEUS, The Large Racket-tailed Drongo. Not observed personally, but occurs in the jungle.

374. ORTHOTOMUS SUTORIUS, The Indian Tailor-bird. Abundant, one of the few birds that regularly eat butterflies and moths.

381. CISTICOLA CURSITANS, The Rufous Fantail-Warbler. Common in grass and reed beds.

382. FRANKLINIA GRACILIS, Franklin's Wren-Warbler. Abundant everywhere.

384. FRANKLINA BUCHANANI, The Rufous-fronted Wren-Warbler. Common in scrub jungle.

464. PRINIA SOCIALIS, The Ashy Wren-Warbler. Abundant especially in gardens.

465. PRINIA SYLVATICA, The Jungle Wren-Warbler. Common in thick scrub and jungle.

466. PRINIA INORNATA, The Indian Wren-Warbler. Fairly common in grass and scrub.

469. LANIUS LAHTORA, The Indian Grey Shrike. Common in scrub and cultivation.

473. LANIUS VITTATUS, The Bay-backed Shrike. Common everywhere.

476. LANIUS ERYTHRONOTUS, The Rufous-backed Shrike. Common everywhere.

488. TEPHRODORNIS PONDICERIANUS, The Common Wood-Shrike. Common especially in jungle. Oates (see O. & B.) says that birds of this genus don't take insects on the wing or on the ground. I have seen them do both and not infrequently.

500. PERICROCOTUS PEREGRINUS, The small Minivet. Very common.

501. PERICROCOTUS ERYTHROPYGIUS, The White-bellied Minivet. Not uncommon in scrub.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

510. GRAUCALUS MACII, The Large Cuckoo-Shrike. Scarce.

544. TEMENUCHUS PAGODARUM, The Black-headed Myna. Abundant.

549. ACRIDOTHERES TRISTIS, The Common Myna. Abundant.

576. CYORNIS TICKELLI, Tickell's Blue Flycatcher. Fairly common along wooded streams.

604. RHIPIDURA ALBIFRONTATA, The White-browed Fantail Flycatcher. Abundant everywhere.

608. PRATINCOLA CAPRATA, The Common Pied Bush Chat. Fairly common especially along telegraph lines. Summer visitor only to N.-W. F. P.

629. CERCOMELA FUSCA, The Brown Rock-Chat. Common. 1 pair hatched out 3 broods consecutively in a nitch within 3 inches of a punkhah rope which was being constantly pulled.

661. THAMNOBIA CAMBAIENSIS, The Brown-backed Indian Robin. Abundant everywhere.

663. COPSYCHUS SAULARIS, The Magpie-Robin. Abundant.

720. PLOCEUS BAYA, The Baya weaver bird. Common ; does not assume summer plumage till July, presumably owing to its late breeding season.

734. UROLONCHA MALABARICA, The White-throated Munia. Abundant.

735. UROLONCHA PUNCTULATA, The Spotted Munia. Scarce.

737. STICTOSPIZA FORMOSA, The Green Munia. Common in jungle.

738. SPORÆGINTHUS AMANDAVA, The Indian Red Munia, fairly common in grass and scrub.

776. PASSER DOMESTICUS, The House-Sparrow. The usual pest.

803. MELOPHUS MELANICTERUS, The Crested Bunting. Common especially in scrub-jungle and about rocky hills.

809. COTILE SINENSIS, The Indian Sand-Martin. Not very common.

811. PTYONOPROGNE CONCOLOR, The Dusky Crag-Martin. Common.

818. HIRUNDO SMITHII, The Wire-tailed swallow. Abundant.

819. HIRUNDO FLUVICOLA, The Indian Cliff-swallow. Abundant. Breeds almost all the year round.

823. HIRUNDO ERYTHROPYGIA, Syke's Striated Swallow. Common among the rocky hills of Bhopal and in the city.

831. MOTACILLA MADERAPATENSIS, The Large-Pied Wagtail. Abundant.

847. ANTHUS RUFULUS, The Indian Pipit. Common in grass and in open scrub. This and next species are only Summer visitors to N.-W. F. P.

861. ALAUDA GULGULA, The Indian Sky-Lark. Fairly common.

871. MIRAFRA ERYTHROPTERA, The Red-winged Bush-Lark. Abundant in grass, scrub and open jungle. Still nesting in September.

875. GALERITA DEVA, Syke's Crested Lark. Common.

895. ARACHNECHTHRA ASIATICA, The Purple Sun-bird. Abundant, becomes scarce in July and August. Summer visitor only to N.-W. F. P.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

921. PIPRISOMA SQUALIDUM, The Thick-billed Flower-pecker. Fairly common.

972. LIOPICUS MAHRATTENSIS, The Yellow-fronted Pied Woodpecker. Common.

976. IYNGIPICUS HARDWICKII, The Indian Pigmy Woodpecker. Scarce.

986. BRACHYPTERNUS AURANTIUS, The Golden-backed Woodpecker. Abundant.

991. CHRYSOCOLAPTES FESTIVUS, The Black-backed Woodpecker. Occurs in the jungle but is rare.

1019. XANTHOLAEMA HAEMATOCEPHALA, The Coppersmith. Abundant.

1022. CORACIAS INDICA, The Indian Roller. Common.

1033. CERYLE VARIA, The Indian Pied Kingfisher. Common.

1035. ALCEDO ISPIDA, The Common Kingfisher. Common.

1043. PELARGOPSIS GURIAL, The Stork-billed Kingfisher. Fairly common. A very close sitter.

1044. HALCYON SMYRNENSIS, The White-breasted Kingfisher. Abundant.

1062. LOPHOCEROS BIROSTRIS, The Grey Hornbill. Common.

1067. UPUPA INDICA, The Indian Hoopoe. Common.

1073. CYPSELUS AFFINIS, The Indian House Swift. Common.

1086. MACROPTERYX CORONATA, The Indian Crested Swift. Fairly common in the jungle.

1089. CAPRIMULGUS MAHRATTENSIS, Syke's Nightjar. Rather scarce.

1090. CAPRIMULGUS MONTICOLA, Franklin's Nightjar. Common in scrub and jungle, easily distinguished from other species by its note *pchee*, though this was only heard from mid-April till June.

1091. CAPRIMULGUS ASIATICUS, The Indian Nightjar. Common.

1095. CAPRIMULGUS INDICUS, The Jungle Nightjar. Fairly common in jungle. Its curious cry *cuckoo* (the u pronounced like the u in luck) is very distinctive, it is used by both sexes. I have only heard it in the breeding season.

1129. TACCOCUA LESCHENAULTI, The Sirkeer Cuckoo. Fairly common in grassy jungle.

1130. CENTROPUS SINENSIS, The Crow-Pheasant. Abundant.

1135. PALÆORNIS NEPALENSIS, The Large Paroquet. Fairly common.

1138. PALÆORNIS TORCUATUS, The Rose-ringed Paroquet. Only too common.

1139. PALÆORNIS CYANOCEPHALUS, The Western Blossom-headed Paroquet. Common.

1161. SYRNIUM OCELLATUM, The Mottled Wood-Owl. Common. Call—a drawn out "*oo-waa*" very distinct, answer *cook*.

1164. KETUPA ZEYLONENSIS, The Brown Fish-Owl. Common.

1168. BUBO BENGALENSIS, The Brown Rock Owl. Common.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1178. SCOPS BAKKAMŒNA, The Collared Scops Owl. I am not *absolutely* certain as to the species of Scops. This one emerges from a thick tree at dusk—and utters a cry very like the half bark, half howl of a terrier in an exiciting dream—the sound resembles "*beo*"

1180. ATHENE BRAMA, The Spotted Owlet. Abundant.

1187. NINOX SCUTULATA, The Brown Hawk-Owl. Apparently scarce.

1191. OTOGYPS CALVUS, The King Vulture. Very common.

1192. GYPS FULVUS, The Griffon Vulture. Not common.

1194. GYPS INDICUS, The Indian Long-billed Vulture. Not common.

1196. PSEUDOGYPS BENGALENSIS, The Indian White-backed Vulture. Very common.

1197 NEOPHRON GINGINIANUS, The Smaller White Scavenger Vulture. Very common.

1203. AQUILA VINDHIANA, The Tawny Eagle. Fairly common.

1205. AQUILA MACULATA, The Spotted Eagle. Not uncommon about jheels.

1211. SPIZAETUS CIRRHATUS, The Crested Hawk-Eagle. Occurs in the jungle.

1216. CIRCAETUS GALLICUS, The Short-toed Eagle. Fairly common.

1220. BUTASTUR TEESA, The White-eyed Buzzard-Eagle. Our commonest bird of prey.

1226. POLIOAETUS ICHTHYAETUS, The Large Grey-headed Fishing Eagle. Occur occasionally on the Bhopal jheel.

1228. HALIASTUR INDICUS, The Brahminy Kite. Rather scarce.

1229. MILVUS GOVINDA, The Pariah Kite. Abundant.

1230. MILVUS MELANOTIS The Large Indian Kite. Fairly common.

1232. ELANUS CÆRULEUS, The Black-winged Kite. Not uncommon in scrub and jungle.

1244. ASTUR BADIUS, The Shikra. Abundant.

1249. PERNIS CRISTATUS, The Crested Honey-Buzzard. Fairly common. Found a nest on a bare leafless tree (see O. and B.).

1257. FALCO JUGGER, The Laggar Falcon. Not common.

1264. ÆSALON CHICQUERA, The Turumti Merlin. Fairly common.

1272. CROCOPUS CHLOROGASTER, The Southern Green Pigeon. Common especially in the jungle. The Green Pigeon is supposed by Hume (see O. and B.) never to drink—as I was passing a jungle pool on 27th May last a *C. chlorogaster* flew up from it, 5 minutes later another flew down and drank. On my approach next day one again flew up and three minutes later 2 flew down and drank simultaneously. This was 6 p.m. (both days), so if they have a regular drinking hour it is probably earlier, as no others were seen later.

1292. COLUMBA INTERMEDIA, The Indian Blue Rock-Pigeon. Common.

1307. TURTUR SURATENSIS, The Spotted Dove. Abundant.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1309. TURTUR CAMBAYENSIS, The Little Brown Dove. Abundant.

1310. TURTUR RISORIUS, The Indian Ring-Dove. Abundant.

1311. ŒNOPOPELIA TRANQUEBARICA, The Red Turtle-Dove. Common especially in the jungle, except during the rains when it becomes scarce. Summer visitor only to N.-W. F. P.

1317. PTEROCLES FASCIATUS, The Painted Sand-Grouse. In dry weather keeps to the jungle and thick scrub but in the rains (June to October) moves into open scrub on high ground and seems to keep more in flocks then. Drinking hours appear to be twilight morning and evening. Nests in February and March.

1324. PAVO CRISTATUS, The Peacock. Abundant.

1350. GALLOPERDIX LUNULATA, The Painted Spur-fowl. Fairly common in jungle.

1356. COTURNIX COROMANDELICA, The Rain Quail. Common.

1357. PERDICULA ASIATICA, The Jungle Bush-Quail. Abundant. Put up a family just fledged on January 16th.

1358. PERDICULA ARGUNDA, The Rock Bush-Quail. Not nearly so common as the last.

1373. FRANCOLINUS PICTUS, The Painted Partridge. Common nests in April, May and June.

1375. FRANCOLINUS PONDICERIANUS, The Grey Partridge. Common, nests from February to the end of April.

1382. TURNIX PUGNAX, The Bustard-Quail. Not common.

1400. AMAURORNIS AKOOL, The Brown Crake. Common.

1401. AMAURORNIS PHŒNICURUS, The White-breasted Water-hen. Common. Nests in May and June. Breeding cry Kawak (repeated) very loud and uttered from thick cover.

1409. GRUS ANTIGONE, The Sarus. Abundant. 2 nests with eggs found on 28th December (see O. and B.). One of the parents was sitting and on being approached became very excited and danced about in front and over its nest.

1416. SYPHEOTIS AURITA, The Lesser Florican. Scarce.

1418. ŒDICNEMUS SCOLOPAX, The Norfolk Plover. Common in open jungle and fairly so in scrub. Very noisy after dusk and before dawn.

1429. HYDROPHASIANUS CHIRURGUS, The Pheasant-tailed Jacana. Abundant.

1431. SARCOGRAMMUS INDICUS, The Red-wattled Plover. Abundant.

1433. SARCIOPHORUS MALABARICUS, The Yellow-wattled Plover. Fairly common in thick scrub.

1447. ÆGIALITIS DUBIA, The Little Ringed Plower. Fairly common.

1488. ROSTRATULA CAPENSIS, The Painted Snipe. Not very common.

1503. STERNA SEENA, The Indian River-Tern. Common.

1504. STERNA MELANOGASTER, The Black-bellied Tern. Fairly common.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1545. PLATALEA LEUCORODIA, The Spoonbill. Common.

1548. DISSURA EPISCOPUS, The White-necked Stork. Fairly common in jungle.

1552. PSEUDOTANTALUS LEUCOCEPHALUS, The Painted Stork. Common.

1554. ARDEA MANILLENSIS, The Eastern Purple Heron. Common in reed beds and jheels.

1555. ARDEA CINEREA, The Common Heron. Common.

1559. HERODIAS ALBA, The Large Egret. Rather scarce.

1560. HERODIAS INTERMEDIA, The Smaller Egret. Abundant.

1561. HERODIAS GARZETTA, The Little Egret. Abundant.

1562. BUBULCUS COROMANDUS, The Cattle Egret. Scarce.

1565. ARDEOLA GRAYI, The Pond Heron. Very abundant.

1567. BUTORIDES JAVANICA, The Little Green Heron. Rather scarce but occurs along wooded streams.

1568. NYCTICORAX GRISEUS, The Night Heron. Not very common.

1589. DENDROCYCNA JAVANICA, The Common Whistling Teal. Common, saw a young one not fully fledged on December 5th.

1593. ANAS PŒCILORHYNCHA, The Spot-billed Duck. Abundant, a duck followed by 9 tiny ducklings seen on November 28th.

1617. PODICIPES ALBIPENNIS, The Indian Little Grebe. Abundant, occurs in big flocks on the Bhopal Lake.

V.—DOUBTFUL WHETHER MIGRANTS OR NOT.

40. SYLVIPARUS MODESTUS, The Yellow-browed Tit. Shot one on 17th October 1909, the only one seen but from its close resemblance to a Flower Pecker (*P. squalidum*) it may have been overlooked, confirms Jerdon's record (see O. and B.)

389. MEGALURUS PALUSTRIS, The Striated Marsh-Warbler. Flushed several in reed beds and marshes in September and one in November (shot 1 and sent it to the B. M.)

551. ACRIDOTHERES GINGINIANUS, The Grey Bank Myna. Not common, only seen in winter.

601. HYPOTHYMIS AZUREA, The Black-naped Flycatcher. Only met with in April in high jungle.

607. RHIPIDURA PECTORALIS, The White-spotted Fantail Flycatcher. Scarce. Not observed at all between mid-October and mid-February.

1383. TURNIX DUSSUMIERI, The Little Button-Quail. Not common. Only met with in December and January.

1404. PORPHYRIO POLIOCEPHALUS, The Purple Moorhen. Scarce, only noted between September and February.

1428. METOPIDIUS INDICUS, The Bronze-winged Jacana. Common from early October to May, but only once seen after May 3rd and that was on June 22nd.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1510. STERNA MINUTA, The Little Tern. Only seen in June, it was then in breeding plumage.

1517. RHYNCHOPS ALBICOLLIS, The Scissor-bill. Only seen in July.

1526. PHALACROCORAX CARBO, The Large Cormorant. Scarce, probably resident but not noticed from 10th July till October.

1542. INOCOTIS PAPILLOSUS, The Black Ibis. Only met with by a jungle stream in May.

1575. PHOENICOPTERUS ROSEUS, The Common Flamingo. Only seen in July.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART XII.

(*With Plate XI*).

(*Continued from page 602 of Volume XX.*)

We now finally arrive at the species comprised in Tribe IV, *Ophrydeæ*, of which the general characters were given on p. 433 (Vol. XVI).

In the Flora of British India all the Bombay plants comprised in this Tribe have been aggregated under the generic title of *Habenaria*. Dr. T. Cooke, in his recently published *Flora of Bombay*, has, however, subdivided them into three genera, and as his work will probably be the text book for many years to come, it may be most expedient for us to follow his example.

The characters of his three genera are shortly, terrestrial, tuberous herbs, *leaves* membranous or fleshy.

* *Sepals* subequal and more or less connivent; *petals* equal to or shorter than the *sepals*..... 29. Peristylus.

** *Sepals* unequal, the *lateral* more or less spreading. *Stigmas* sessile or subsessile, confluent or more or less distinct..... 30. Platanthera.

Stigmas more or less distinctly stalked, very rarely confluent ..... 31. Habenaria.

29. *Peristylus.*

Terrestrial. *Flowers* in *spikes* terminating the leafy stems, *sepals* and *petals* subequal, often connivent, *lip* continuous with the *column*, produced at the base into a short *spur*, *column* short; *anther cells* parallel; apex inferior, short and adnate to the base of the *column*; *pollinia* granular with short caudicles and exserted naked *glands*; *staminodes* lateral, auriculate; *stigma* sessile; *rostellum* serrulate or tooth-like, situated between the *anther cells*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

* *Spur* as long as or longer than the sepals, subclavate ..... 1. P. Stocksii.

** *Spur* shorter than the sepals, globose or ellipsoid.

a. Stem leafy, the leaves scattered or subimbricate..... 2. P. spiralis.

b. Leaves clustered about the middle of the stem. *Lip* shorter than the sepals, *petals* white ..... 3. P. plantagineus.

Flowers yellowish-green, *spikes* dense, long. *Lip* as long as *sepals*, *lateral sepals* mucronate behind below apex 4. P. goodyeroides. var. affinis.

Flowers yellow, spikes lax, short, *lip* as long as *sepals*, *lateral sepals* not mucronate below apex ..... 5. P. Lawii.

1. PERISTYLUS STOCKSII, *Kranzlin; T. Cooke, Fl. of Bombay, II, p. 710*; Habenaria Stocksii, *Hook. f. Fl. Br. Ind., VI, p. 158.*

Whole plant 6 to 18 inches high, *stems* slender, with numerous sheaths on the lower part; *leaves* more or less clustered towards the middle of the stem, variable, 3 to 6 inches long by $\frac{1}{2}$ to $1\frac{1}{2}$ inches broad, obovate or elliptic or lanceolate obtuse, acute or acuminate, usually petioled. *Spikes* twisted, 3 to 6 inches long, *flowers* yellowish, secund, $\frac{1}{6}$ inch in diameter, *bracts* longer than the *ovaries*, ovate acuminate, $\frac{1}{5}$ to $\frac{5}{8}$ inch long, *sepals* 1-nerved, *dorsal* elliptic oblong obtuse, *lateral* linear—oblong, at length reflexed, *petals* larger, ovate, obtuse, fleshy, *lip* shorter than the sepals, obtusely 3-fid, *claw* broad, concave, *lateral lobes* a little shorter and narrower than the midlobe, slightly incurved, *midlobe* oblong obtuse, *spur* shorter than the ovary, *pollinia* clavate, *stigmatic lobes* clavate, *rostellum* minute, erect 2-fid.

Flowers appear during July and August.

Distribution.—Throughout the Konkan, North Kanara and hills of the Western Peninsula generally.

2. PERISTYLUS SPIRALIS, *A. Rich.; T. Cooke, Fl. of Bombay, II, p. 711*; Habenaria torta, *Hook. f., Fl. Br. Ind., VI, p. 159.*

Whole plant 6 to 18 inches high, *stem* slender, leafy, often

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

flexuous; *leaves* 1 to 2½ inches long by ¼ to ⅜ inch broad, linear-lanceolate, obtuse, acute or acuminate, coriaceous, sheathing at the base, the *upper* passing into numerous, lanceolate sheaths. *Spikes* 2 to 10 inches long, lax-flowered, twisted, *flowers* greenish white, secund, ⅓ inch in diameter, *bracts* ¼ inch long, lanceolate, finely acuminate, equalling or the lower exceeding the ovary, *dorsal sepal* linear oblong obtuse, concave, *lateral* linear obtuse, falcate, *petals* linear—oblong obtuse, *lip* equalling the sepals, variable, fleshy, rather longer than broad, *claw* short, broad, concave, *blade* 3-cleft beyond the middle, *side lobes* narrower than the midlobe, linear acute, *midlobe* linear, obtuse, *spur* small, globose, *anthers* minute, the *cells* parallel, *tubes*. *Pollinia* pyriform, *caudicle* short, *glands* oblong, *stigmatic processes* short, clavate, *rostellum* 3-fid.

Flowers appear in July and August.

Distribution.—Throughout the Konkan, Western Ghats and North Kanara and Hills of the Western Peninsula, Ceylon.

3. PERISTYLUS PLANTAGINEUS, *Lindl. Gen. & Sp. Orchid., p. 300*; *T. Cooke, Fl. of Bombay, II, p. 711*: P. elatus, *Dalz. & Gibs., p. 270*; Habenaria Wightii, *Trimen, Fl. Br. Ind., VI, p. 162.*

Plant about 2 feet high, bituberculate, *stem* robust, lower part with loose *sheaths*; *leaves* about the middle of the stem, 5 to 7 inches long by 2 to 3 inches broad, oblong-lanceolate acuminate, strongly nerved beneath, closely sheathing at the base. *Spikes* 4 to 8 inches long, lower part clothed with lanceolate sheaths, *bracts* ½ inch long, sheathing, acute, almost reaching to the tips of the *flowers*, which are very small, ½ inch in diameter and densely crowded, greenish white, *dorsal sepal* ovate obtuse, 1-nerved, *lateral* narrower, *petals* obliquely orbicular, 3-nerved, *lip* white, almost fiddle-shaped, *lateral lobes* narrow, with small projecting teeth, *midlobe* rounded, *spur* small, globular, *pollinia* pear-shaped, very granular, *caudicle* very short, *gland* small.

Flowers in August.

Distribution.—Konkan and North Kanara, Western Peninsula and Ceylon.

4. PERISTYLUS GOODYEROIDES, *Lindl, var.* affinis, *Lindl., T. Cooke, Fl. of Bombay, II, p. 712*; *Dalz. & Gibs. p. 270*; Habenaria goodyeroides, *Grah.; Fl. Br. Ind., VI, p. 161.*

Stem 1 to 2 feet high, stout. *Leaves* collected about the middle

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of the stem, 6 to 10 inches long by 2 to $2\frac{1}{2}$ inches broad, elliptic lanceolate acute, almost sessile. *Spikes* dense, 4 inches to a foot long. *Flowers* yellowish-green, *bracts* membranous, lanceolate, acuminate, from $\frac{1}{2}$ to $\frac{3}{4}$ inch long, becoming as short as the sessile *ovary* upwards, *lateral sepals* $\frac{1}{5}$ by $\frac{1}{12}$ inch, oblong obtuse, mucronate behind below the apex, *dorsal sepal* $\frac{1}{5}$ by $\frac{1}{10}$ inch, elliptic oblong, obtuse, not mucronate, *petals* as long as but slightly broader than the sepals, obliquely obovate, strongly nerved, *lip* equalling the petals, sessile, usually 3-fid, the *lobes* very variable, *spur* subglobose, $\frac{1}{12}$ inch long, *anther* small, *tubes* very short, *pollinia* clavate, *rostellum* erect, toothed.

Flowers appear during July and August.

Distribution.—Konkan, North Kanara, E. Himalayas, Khasia and Naga Hills, Hills of the Western Peninsula.

5. PERISTYLUS LAWII, *Wight; T. Cooke, Fl. of Bombay, II, p. 712; Dalz. & Gibs., p. 270*; Habenaria Lawii, *Hook. f. Fl. Br. Ind., VI, p. 162.*

Stem up to a foot in height, clothed with loose *sheaths* below the leaves which are in clusters of 3 to 5 towards the middle of the stem. These are $2\frac{1}{2}$ to 4 inches long by $\frac{3}{4}$ to $1\frac{1}{2}$ inch broad, membranous, oblong-lanceolate acute, not sheathing at the base. *Spikes* narrow, erect, lax, 2 to 3 inches long. *Flowers* yellow, *bracts* less than $\frac{1}{2}$ inch long, lanceolate acuminate, exceeding the *ovary*. *Sepals* all 1-nerved, *lateral* $\frac{1}{8}$ by $\frac{1}{16}$ inch, oblong obtuse, *dorsal* $\frac{1}{8}$ by $\frac{1}{10}$ inch, oblong obtuse, concave, *petals* similar, oblong obtuse, *lip* $\frac{1}{8}$ by $\frac{1}{10}$ inch, *claw* concave, *apex* shortly 3-lobed, *lobes* subequal, obtuse *spur* short, globular, *anther tubes* absent, *pollinia* clavate, *caudicle* absent, *glands* small, *stigmatic processes* very short, clavate, *rostellum* short, triangular, acute.

Flowers appear during July and August.

Distribution.—Konkan, Western Ghats, Southern Mahratta Country, Western Peninsula, Bengal.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FURTHER NOTES ON SOME MAMMALS FROM LOWER SIND.

BY

R. C. WROUGHTON.

As mentioned in an Editorial footnote to my paper *On A Small Collection of Rodents from Lower Sind* in the last number of the Journal some other specimens, besides those recorded, were included in Mr. Priestley's Collection. These unfortunately did not reach me in time to be published in the above paper but as there are several interesting specimens amongst them it has been thought worth while to publish the following list to which is also added some notes on hares obtained in adjacent districts :—

Erinaceus blanfordi, Anders.

♂ 18? 17.

The specimens have no parting on the crown and it is possible that after all *jerdoni* and *blanfordi* may prove to be separate species. To settle this question specimens like these from Rohri, the type locality of *blanfordi*, are a *sine qua non*.

(39). *Felis ornata*, Grey and Hardw.

1832. *Felis ornata*, Grey and Hardwicke. Ill. Ind. Zool. i., pl. 2.

♂ 41, 42, 43, 44, 48. ♀ 40, 49, 51.

A fine series, very constant in essential characters.

(60 part.) *Mungos ferrugineus*, Blanf.

1874. *Herpestes ferrugineus*, Blanford. P. Z. S., p. 661. pl. lxxxi.

♂ 55, 64. ♀ 56, 62.

These specimens are undoubtedly *ferrugineus*, Blanf., which was based on a specimen from Larkhana, Sind. The ochraceous colouring is much exaggerated in the plate accompanying Blanford's description. The synonymy of the Common Indian Mungoose, recorded as *Herpestes mungo* in Blanford's Mammalia, is very involved and obscure, but by whatever name it is known whether *mungo*, *nemo*, *griseus*, or *nyula*, &c., it is different from the Sind form, which shows quite constantly an ochraceous tint in its pale colouring and the ferrugineous tail tip which so markedly characterises it.

(58 part.) *Mungos pallipes*, Blyth.

1845. *Herpestes pallipes*, Blyth. J. A. S. B., xiv, p. 346.

♂ 53.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The type locality of *pallipes* is Kandahar. It is a pale form of *auropunctatus*, Hodg., from Nepal. On the material available I have no hesitation in separating the two, both being constant forms in their respective habitats. When our Mammal Survey is completed it may prove that the Sind form deserves no more than subspecific rank.

(72) *Vulpes bengalensis*, Shaw.

1800. *Canis bengalensis*, Shaw., Gen. Zool. i., p. 330.

♂ 45.

If *kokree*, Sykes, the Dekhan form is separable from true *bengalensis*, then geographically the present animal should be most closely allied to the former but the material available for comparison is so inadequate that I am not in a position to advance an opinion. A series of typical specimens from Bengal is a great desideratum.

(74) *Vulpes leucopus*, Blyth.

1854. *Vulpes leucopus*, Blyth. J. A. S. B., xxiii., p. 729.

♀ 46, 47.

Blyth gives no exact locality for his *leucopus* but speaks of it as "the small desert Fox of W. India." His description is therefore probably a generalised one. The present specimens do not agree with his description in several details, but nevertheless it does not seem possible that they could be anything else. His *pusillus* from the Salt Range is apparently a different animal with conspicuous black cheeks. Series of the several varieties of the Fox inhabiting N.-W. India are a great desideratum and until they are available it seems to me hopeless to try and unravel the tangle of Blyth's *leucopus*, *griffithi*, *pusillus*, &c.

(291) *Grypomys gleadowii*, Murr.

1885. *Mus gleadowii*, Murray. P. Z. S., p. 809.

3 ♀♀ in spirit (one presented to the National Collection).

The type locality is Karrachi. It has not been taken again anywhere since its description by Murray in 1885. Indeed the two original specimens and the present three are so far as I know the only ones to be found in any museum.

(321) *Lepus dayanus*, Blanf.

1874. *Lepus dayanus*, Blanford. P. Z. S., p. 663.

♂ 84. ♀ 81, 82, 83, 22.2.11. N. B. Kinnear, Thar and Parkar.

Lepus sp.

♂ 28. ♀ 27. S. H. Prater, Viramgaum.

Lepus sp.

♀ 2. N. B. Kinnear, Shamgarh.

Mr. Kinnear's four specimens from Thar and Parkar are, I believe, undoubtedly *dayanus*. A specimen from Rajputana in the Natural History Museum Collection obtained by Blanford is labelled in his own handwriting

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"intermediate between *dayanus* and *ruficaudatus*. Mr. Prater's Viramgaum specimens seem very similar while Mr. Kinnear's Shamgarh specimen seems to resemble much more closely the type which represents to me true *ruficaudatus*. This last name was given by Geoffray with but a few words of description to a specimen from 'Bengal.' Until a series of typical Bengal specimens is available with other series linking it geographically with *dayanus* it seems to me the riddle of the Indian Hares will remain a riddle.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SOME NOTES ON BIRDS FROM GYANTSE AND CHUMBI IN TIBET, WITH A LIST OF THE GAME BIRDS KILLED DURING THE FOUR YEARS, 1906-1909.

BY

CAPTAIN F. M. BAILEY.

Monal (*LOPHOPHORUS REFULGENS*). Tib.—"*Chadang.*"

The Monal is found in the Chumbi Valley up to the tree limit (about 14,000 feet); and I found a nest at Lingmotang at 10,000 ft. on the 15th May 1904. They have a habit of whistling in the early morning, and at this time it is easy to walk through the thick forest towards the sound and shoot them sitting. I found that the following was the best way to get sporting shots; two guns would walk quietly along the road and two men would go through the forest above, these men whistled if they saw any Monal and then put them up when they would fly downhill over our heads. I found that the average weights of birds shot in January were cocks 5 lb. and hens 4lb. 11 oz.

Blood Pheasant (*ITHAGENES CRUENTUS*). Tib.—"*Semo.*"

The Blood Pheasant is common in the Chumbi Valley. I have seen it from 10,000 feet up to the tree limit. It is not a sporting bird, as it seldom flies, and when it does the undergrowth is usually too thick for a shot. I found that the only way to kill the Blood Pheasant was to stalk through the thick forest, usually of rhododendron, which it frequents, and to shoot it on the ground.

I once saw a Tragopan, which had been killed in the Chumbi Valley, and once a Snow Partridge (*Lerwa lerwa*), but both these birds must be very scarce.

Tibetan Snow Cock (*TETRAOGALLUS TIBETANUS*). Tib.—"*Lhapcha Kongmo*" or simply "*Kongmo.*"

This bird is to be found in the Chumbi Valley above the tree limit. It is fairly plentiful at Phari and near Gyantse, and I have frequently taken nests during June and July at altitudes between 14,500 and 15,500 feet. The reason why only 13 were shot in the four years is that this bird lives up on the high hills

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

where Burhel or *Ovis ammon* are also to be found, and it was seldom worthwhile to disturb the larger game by firing at Snow Cock.

Tibetan Partridge (*PERDIX HODGSONIÆ*). Tib.—"*Rhakpa.*"

The Tibetan Partridge is common at Gyantse, and I have also seen it at Dotha and Kambu in the Chumbi Valley, just above tree level. I have taken nests near Gyantse in June, July and the beginning of August. Two good days? partridge shooting for two guns near Gyantse yielded 48 partridges and 25 hares (*Lepus oiostolus*) and 43 partridges and 34 hares respectively. I have seen them at various altitudes between 13,000 and 15,000 feet.

Tibetan Sandgrouse (*SYRHAPTES TIBETANUS*). Tib.—"*Ka ka ling ma*" or "*Ka ka li.*"

These birds may be seen in flocks of from 10 to 20 anywhere north of the Tangla from August to February, and I have once seen them in May. They appear to have no special hour for drinking, and are not at all shy, so it is possible to walk up to within gunshot distance when they are feeding on the bare plains. On being fired at the flock will fly only a hundred yards or so, and will allow another shot to be taken in the same manner. In this way a flock could easily be exterminated, as they do not seem to get any wilder. I have seen them at Kambajong and at various places in the Bramaputra Valley, west of Shigatse. I made every effort to get the eggs of this bird, but without success.

Himalayan Solitary Snipe (*GALLINAGO SOLITARIA*).

I have never been able to find a Tibetan name for a snipe, beyond the ordinary word "Chubja" which refers to duck and other water birds. One man told me that snipe were the young of cranes! The solitary snipe is only seen in winter between the months of September and February. I once shot one at Gyantse on 28th March, but this must have been a straggler. Occasionally they have been shot in the Chumbi Valley. They lie very close and may sometimes be seen sitting in the mud before they rise. Their flight is usually shorter than that of the Fantail or Pintail. I killed 12 in one day, in December, at Samoda, one of the stages on the road to Gyantse. The earliest bird

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

seen was on 31st August and the latest on 28th March. I have never seen the eggs or young birds.

The only other snipe that I have seen are Fantail and Pintail. Unfortunately no note was made of the numbers of each of these two varieties. They arrive at the beginning of August, in which month and in September they are found in the irrigation ditches between the fields at Gyantse. In August, September and October, they occur in large numbers on the marshes round Rham tso (14,700 ft.), the lake passed on the road to Gyantse. So far as I know they do not breed in that locality and I have never seen them in the Chumbi Valley. The earliest bird was shot on 3rd August 1909 and the latest on 28th October. I once shot a stray bird on 15th April.

The Eastern Golden Plover (*CHARADRIUS FULVUS*).

These birds were very plentiful on the marshes at Rham tso, and many more could have been shot; but they are not very sporting birds, and we usually let them off if snipe or duck were to be got. They arrive at the Gyantse with the Snipe, and are to be seen there in August and September. The first bird was shot on 11th August and the last on 29th October. I do not think that they breed there.

Four green plover (*Vanellus vulgaris*) were shot, two in October, one in March, and one on 1st April. A Whimbrel (*Numenius phæopus*) was obtained at Rham tso on 3rd September 1908. Curlew were often seen on this marsh but were never shot. On 2nd May 1908, a Black-tailed Godwit (*Limosa belgica*) was killed at Gyantse. Redshanks (*Totanus calidris*) are common, and I have taken the eggs in May, June and July. Stilts (*Himantopus candidus*), Avocets (*Recurirrostris avocetta*), Greenshanks (*Totanus canescens*) and many other waders, are seen on this marsh in August, September and October, after which months both the lake and the marsh freeze and the birds are obliged to leave. Gulls (*Larus bruneicephalus*) and Terns are common near the lake and are also seen at Gyantse. Two coots (*Fulca atra*) were obtained, one at the beginning of March and the other at the end of October, but these birds are scarce. From the list below it can be seen the species of duck which are found in this part of Tibet.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Bar-headed Goose (*ANSER INDICUS*).

A description of the nesting of the Bar-headed Goose appeared on p. 367 of Vol. XIX. The nests are found at Rham tso (14,700) at the beginning of June.

Brahminy Duck (*CASARCA RUTILA*). Tib.—"*Angba Serpo.*"

I have taken nests at Gyantse (13,100) and at Tuna (15,000) in May. The nest is found in a cliff, sometimes more than a mile from water.

The Ruddy Sheldrake is the only duck of which I have obtained eggs, but I have seen broods of young Mergansers (*M. castor*) on the river in summer at a height of about 14,000 feet.

LIST OF GAME SHOT AT GYANTSE AND IN THE CHUMBI VALLEY DURING THE YEARS 1906-1909.

Black-necked Crane (*Grus nigricollis*) (1)	17
Demoiselle Crane (*Anthropoides virgo*) (1)	3
Bar-headed Goose (*Anser indicus*) (1)	644
Ruddy Sheldrake (*Casarca rutila*) (1)	134
Common Sheldrake (*Tadorna cornuta*) (1)	1
Mallard (*Anas boscas*)	172
Pintail (*Dafila acuta*)	205
Gadwall (*Chaulelasmus strepserus*)	185
Wigeon (*Mareca penolope*)	41
Common Pochard (*Nyroca ferina*)	26
White-eyed Pochard (*Nyroca africana*)	10
Tufted Pochard (*Fuligula fuligula*)	26
Red-crested Pochard (*Netta rufina*)	2
Shoveller (*Spatula clyptea*)	22
Common Teal (*Nettium crecca*)	140
Garganey Teal (*Querquedula circia*)	256
Goosander (*Mergus castor*)	38
Himalayan Solitary Snipe (*Gallinago solitaria*)	70
Snipe (*Gallinago cœlestis & stenura*)	287
Eastern Golden Plover (*Charadrius fulvus*)	150
Green Plover (*Vanellus vulgaris*)	4
Tibetan Partridge (*Perdix hodgsoniæ*)	509
Tibetan Snow-Cock (*Tetraogallus tibetanus*)	13
Tibetan Sand-grouse (*Syrhaptes tibetanus*) (2)	118

(1) Killed only at Gyantse and north of the Tangla.

(2) Killed only in the Chumbi Valley.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Monal Pheasant (*Lophophorus refulgens*)	7
Pigeon (*Columba rupestris*) (1)	351
Snow Pigeon (*Columba leuconota*) (2)	8

The European Hoopoe (*UPUPA EPOPS*). Tib.—"*U-pu-pi-shu.*"

The Hoopoe is to be seen in this part of Tibet in summer only. The first bird I noticed one year appeared on 28th March. It nests at Gyantse (13,100) in June, in holes in walls and cliffs.

The Lammergeier (*GYPAËTUS BARBATUS*). Tib.—"*Cha ko.*"

On the 27th April 1908, in a cliff near Gyantse, at a height of 14,800 feet, a nest was found which contained one young bird; in the same nest there was a single egg on 17th February 1909.

The Himalayan Rough-legged Buzzard (*ARCHIBUTEO HEMIPTILOPUS*). Tib.—"*Cha Kyi.*"

A note and photograph of what I believed to be the nest of this bird was published in Vol. XIX, p. 523; but on comparing the eggs with those of *A. hemiptilopus*, I find that mine are much larger. The bird, which was identified in Bombay as *A. hemiptilopus*, was shot near the nest the day after the eggs were taken and I believed it to be the bird which I had seen in the nest. I must however have shot another bird, and my eggs consequently are unidentified.

The Black-eared Kite (*MILVUS MELANOTIS*). Tib.—"*Ping-gyu-ma.*"

Many nests were seen in May in the trees round the villages on the Gyantse plain (13,100), and one earlier nest on the 17th April. The nests always contained two eggs.

The Kestrel (*TINNUNCULUS ALAUDARIUS*).

I took one nest with four eggs in a cliff at Gyantse on the 23rd of May 1908.

The Osprey (*PANDION HALIAËTUS*).

Ospreys were seen at Gyantse every year in April and May, but did not nest there. I have also seen one in the Chumbi Valley.

(1) Killed only at Gyantse and north of the Tangla.
(2) Killed only in the Chumbi Valley.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Rufous Turtle-Dove (*TURTUR ORIENTALIS*). Tib.—"*Di-di-gu-gu.*"

Nests in small trees at Gyantse, in May and August. I have never taken eggs in June or July. This dove does not remain in the country during the winter.

The Blue Hill Pigeon (*COLUMBA RUPESTRIS*). Tib.—"*Angoa*" or "*Oron.*"

Nests at Gyantse (13,100) and at Kangmar (14,000), in ruined houses, from the end of April till the middle of July.

The Lesser Sand-Plover (*ÆGIALITIS MONGOLICA*).

I cannot be quite certain of the identification of this bird. The nest was taken on the Tangla (15,200) in June.

The Ibis-bill (*IBIDORHYNCHUS STRUTHERSI*).

Nests at Gyantse in May and June and also in the Chumbi Valley, between 10,000 and 14,000 feet (see note on p. 993 of Vol. XIX, Journ., Bom. Nat. Hist. Socy.).

The Black-necked Crane (*GRUS NIGRICOLLIS*). Tib.—"*Trung drung.*"

I have obtained these eggs from the marsh at Rham tso (14,700), at the beginning of June. The bird is common at Gyantse in winter.

The Demoiselle Crane (*ANTHROPOIDES VIRGO*). Tib.—"*Chabung.*"

This bird was twice shot at Gyantse on 13th October 1906 and 28th October 1908. It does not nest in this part of Tibet.

The Raven (*CORVUS CORAX*). Tib.—"*Oroa.*"

At Gyantse on the 15th February 1909, I found one nest containing six eggs in a niche of the wall of an inhabited house, about 15 feet from the ground. The structure was of sticks and about four feet high, the nests of successive years being piled one above the other. I also took a nest on the 12th March 1909. The bird is very common and is the chief scavenger.

The Chough (*PYRRHOCORAX GRACULUS*). Tib.—"*Kyung Ka.*"

Nests are common in May at Gyantse (13,100), and at Tuna (15,000), and once I took a nest containing fresh eggs on the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

30th July. The Chough also nests in the Chumbi Valley in April; one nest was in the roof of the office which I was occupying daily.

The Black-rumped Magpie (*PICA BOTTANNENSIS*). Tib.—"*Kya-ga* or *Tra-ga*."

This bird nests in trees at Gyantse in May. The nest is a very common and conspicuous object.

Wadell's Babax (*BARBAX WADELLI*).—"*Jomo*."

Nests were to be seen in trees at Gyantse (13,100) at the end of April and in May.

Stoliczka's Willow-Tit (*LEPTOPŒCILE SOPHIÆ*).

The nest which usually contains five eggs is found in thorny bushes at Gyantse, at the end of April and at the beginning of May.

Tickell's Willow Warbler (*PHYLLOSCOPUS AFFINIS*).

Gyantse (13,100).

Nests in low bushes at the end of May and in June. The nest is placed very low and is often concealed by growing grass.

The Grey-backed Shrike (*LANIUS TEPHRONOTUS*). Tib.—"*Tré tré*."

Nests were taken at Gyantse (13,100) and at Kangmar (14,000), at the end of June and in July. The nest is placed in a tree or bush.

Gould's Chat (*SAXICOLA MONTANA*).

Nests in holes in banks, near Gyantse (13,100), at the end of May.

The White-capped Redstart (*CHIMARRHORNIS LEUCOCEPHALUS*).

Common in the Chumbi Valley, where I have taken nests at 11,000 feet in June.

The Indian Redstart (*RUTICILLA RUFIVENTRIS*).

One nest containing four eggs was taken at Rham tso (14,700), in a hole in a wall, on 2nd June 1908.

The Plumbeous Redstart (*RHYACORNIS FULIGINOSUS*).

One nest at Chumbi (9,800), on 10th July 1908. The nest was in an overhanging bank.

The Robin Accentor (*ACCENTOR RUBECULOIDES*).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

One nest was taken at Dochen, at a height of 15,500, on 2nd July 1908. The bird is common at Gyantse. (See p. 222, Vol. XX.)

The Rufous-breasted Accentor (*ACCENTOR STROPHIATUS*).

One nest was found in a low bush at Kangmar (14,000), on 27th June 1906.

The Beautiful Rose-Finch (*PROPASSERS PULCHERRIMUS*). Tib.---"*A-u-luk-se.*

At Gyantse (13,100) and at Kangmar (14,000) the nests were common in July and August.

Severtzoff's Rose-Finch (*CARPODACUS SEVERTZOVI*).

Nidification similar to *P. pulcherrimus.*

Walton's Twite (*LINOTA RUFO-STRIGATA*).

Nidification similar to *C. Severtzovi* and *P. pulcherrimus.*

Adams's Mountain Finch (*MONTIFRINGILLA ADAMSI*). Tib.---"*Ib Je.*"

This bird is common at Phari, where it nests at the beginning of June in the disused holes of the Mouse hare.

The Red-necked Mountain Finch (*MONTIFRINGILLA RUFICOLLIS*).

Nidification is similar to that of *M. adamsi.* A note appeared at p. 221 of Vol. XX.

The House Sparrow (*PASSER DOMESTICUS*). Tib.--"*Kang che.*"

The House Sparrow is very common and nests throughout the summer.

The Cinnamon Tree-sparrow (*PASSER CINNAMOMEUS*).

Nests were taken at Gyantse in old walls, but unlike the House Sparrow, not in inhabited houses.

The Sand-martin (*COTILE RIPARIA*).

I found a great many sand martins' nests in a cliff at Rham tso (14,700) on 2nd June 1908.

The Crested Lark (*GALERITA CRISTATUS*).

Kala (14,000) Two nests containing 3 eggs each were found on 30th June 1908.

Elwes's Horned Lark (*OTOCORYS ELWESI*).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Rham tso (14,700), and Tangla (15,200). Nests are common in June, and usually contain two eggs but sometimes three.

Brooke's Short-toed Lark (*CALANDRELLA BRACHYDACTYLA TIBETANA*).

Very plentiful at Gyantse (13,100), where it nests in May. A little later in the year, I have found nests at higher altitudes up to the Tangla (15,200); the latest nest was taken on 10th July 1908.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE IMPROVEMENT IN THE YIELD AND QUALITY OF INDIAN WHEAT

BY

ALBERT HOWARD, M.A., A.R.C.S., F.L.S., *Imperial Economic Botanist*,

and

GABRIELLE L. C. HOWARD, M.A., *Associate and some time Fellow of Newnham College; Personal Assistant to the Imperial Economic Botanist.*

I. INTRODUCTION.

In the present paper it is proposed to give a sketch of the wheat investigations in India which have formed a part of the work of the Section of Economic Botany of the Agricultural Research Institute at Pusa during the past five years from 1906 to the present time. While the actual results obtained and especially those results which bear on the Indian wheat trade will naturally receive most attention in this paper, an attempt will also be made to indicate the scientific methods which have been adopted in prosecuting these investigations. In this way it is hoped that this paper will prove of interest both to those particularly concerned with the trade aspect of wheat and also to the members of a scientific society who will not be disappointed to find that the results obtained in applied work must be based on sound biological principles.

It is almost superfluous to point out the great importance of the wheat crop to India, not only from the point of view of the food of the people, but also as regards the value of the export trade. Nearly 30,000,000 acres of wheat are grown every year and in favourable seasons from 8 to 9 millions tons of grain are produced, of which more than 80 per cent. is consumed in the country. The surplus forms an important article of trade with Europe.

The recent investigations on wheat in India date from January 1906 when one of us was asked to draw up a scheme for the improvement of the wheat crop for consideration by the Board of Agriculture in India. This memorandum was adopted by the Agricultural Department as the basis for future work on Indian wheat.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

II. The Agricultural Survey of the Wheats of India.

The first condition for the improvement of any crop is the acquisition of an intimate knowledge of that crop and of its production in all its manifold details. In the case of a European dealing with an Indian crop and with an agriculture essentially different from that of North Europe, the need for the closest possible study of the local conditions cannot be over-estimated. In India the present agricultural practices are firmly established on the basis of long traditional experience. The wheats at present in cultivation in this vast Empire represent the survival of types most fitted for the conditions of the various tracts. Nature has eliminated the unfit, and the experience of past centuries, handed down by tradition has taught the cultivator what soils and what tracts are most suitable for this crop. Varieties of wheat introduced by sea from other countries, have, in recent times at any rate, had no influence on the crop and have not been adopted by the cultivators. As far as can be ascertained no new forms have been introduced by selection or hybridization as has been the case in Europe and America. From two points of view, therefore, the position is of particular interest. In the first place, we are dealing with an ancient agriculture, in the second, with a crop which has left almost entirely to natural influences.

The necessity of studying the kinds of wheat now grown in India needs little explanation. When the crop has been thoroughly surveyed the investigator is able to see how far the present wheats are suitable for local purposes and also for the export trade. He will perceive where improvements can be made with the greatest chance of success and in what directions his science can be most profitably applied.

Fortunately in 1906 when this work was taken up considerable progress had been made in the various Provinces in collecting and growing at a central station most of the mixed wheats from the various Districts. In the Punjab and in the United Provinces especially this collection of material proved of the greatest value to us in rapidly ascertaining the kinds of wheat now grown in the Plains. At the same time a large collection of Indian wheats was

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

grown by us at Pusa under dry farming conditions and later on at Lyallpur on the Chenab Colony of the Punjab under canal irrigation. In this way we were enabled to begin acquiring first-hand experience of growing wheat under Indian conditions. This experience has proved essential to the development of the work and any success we have obtained therein has been, in our opinion, largely due to our having taken up the agricultural side of the work in addition to its more purely botanical aspect.

It was found that the wheat crop as grown by the cultivators was in almost all cases a mixture of a large number of varieties and that the first thing to do was to resolve these mixtures into their constituents. No useful work can result from dealing with these mixtures. Some of the constituents may be really excellent types in all respects, but their agricultural characters and milling and baking qualities, would be masked by the mass of inferior sorts making up the bulk of the sample. All that an examination of such samples would tell us is the average quality of all the wheats of any particular tract.

Two distinct stages are involved in the resolution of these wheat mixtures. In the first place the various species are separated into their botanical varieties and this is done by an examination of the ripe ears in the laboratory. The second stage in the resolution of the mixtures is the separation of the botanical varieties (which in the laboratory appear uniform) into what we have called agricultural types. If a large number of ears of the same botanical variety are sown separately next to next and the cultures examined it will in many cases be found that they differ from each other in many field characters such as foliage, general habit of growth, time of flowering, resistance to rust, standing power and in yield and quality of grain. These field characters are not recognised by systematic botany, but they are of by far greater importance to the cultivator than colour of chaff, etc. Thus what a systematic botanist would call a pure wheat is often a mixture of many different kinds. The determination of the ultimate units of our mixtures can therefore only be done by the close study in the field of a large number of cultures each starting

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

from one ear. As a rule this involves at least three years' work and if there are any accidents a longer period.

This tedious separation of the mixed wheats of a Province into their ultimate constituents is an example of that drudgery in scientific work which is so often necessary. As the wheats are being separated and grown singly their agricultural characters, rust resistance, yielding power and milling and baking characters can be studied. At the same time suitable material for selection and hybridization work becomes available.

III. Improvement of Wheat by selection.

In order to appreciate the modern methods of selection, which can be applied to a crop like wheat, which normally self-fertilizes, it is necessary to realise the constitution of an Indian wheat-field and also the complexity of most of the botanical varieties of wheat in India. As we have seen the botanical varieties can be separated into agricultural types differing from each other in field characters. It is these types which form the raw material as it were for improvement by selection. The assemblage of individuals constituting an agricultural type is termed a population and these individuals may differ from each other in yielding power. If they do the pure line which has the highest yielding power can be separately propagated, and if it is a desirable wheat in all other respects its selection and separate growth will constitute an improvement. The essence of selection therefore depends on the comparison of the offspring of single plants and not on the comparison of the plants themselves. Once the best pure line in an agricultural type has been selected it is believed that no further improvement is possible by this method. All that is necessary is to maintain the improvement.

Applying these principles to the wheats of India, we have been able to isolate a number of wheats of exceedingly high grain quality, some of which are being exhibited to-day. Some of these high quality wheats also yield well, are rust resistant and are being grown this year on a large scale at a number of stations in the plains. The best of these will be grown on a much larger scale and will be distributed to the cultivators in those tracts which suit their particular requirements.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

IV. Hybridization.

Besides selection there is another method by which the kinds of wheat grown in India can be improved, namely, hybridization, or the application of the principles which have been founded on the work of Mendel. By means of this method, it is possible to create new wheats combining the desirable qualities of both parents. Hybridization has greater possibilities than selection, but on the other hand the process is laborious and time consuming as the production and testing of a new wheat hybrid cannot be done under four years.

Hybridization like selection is only possible after the separation of mixed wheats into their ultimate constituents. In modern wheat breeding it is desirable to use for crossing only pure lines, *i.e.*, the progeny of single plants. It frequently happens when a wheat mixture has been resolved into its constituents that all the desirable qualities are not found in any one wheat. Thus some wheats, characterised by high-yielding capacity, may be defective either in quality, in resistance to rust or in strength of straw. Others, on the other hand, may possess these latter characters, but may give poor yields. It is in producing new wheats, perfect in all respects, that hybridization as a method of improvement has its value.

Passing over the inheritance of ordinary morphological characters of wheat, such as the presence or absence of beards, colour of the chaff and grain, and so on, the characters of special value in wheats are quality of grain, yielding power, strength of straw and resistance to rust. It is found in breeding that all these qualities and their opposites behave as unit characters and pass over as a whole to the various hybrid generations. For example, when a rust liable and rust resistant wheat are crossed, the plants of the first hybrid generation are all rust-liable like one of the parents. In this generation the rust resistant character of the other parent is latent or recessive. Rustiness, on the other hand, is said to be dominant. In the second generation, however, splitting takes place in the proportion of three rusty plants to one rust-resistant plant. These latter in succeeding generations breed true as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

regards this character. It is possible, therefore, by crossing to introduce the character of rust-resistance into a wheat wanting in this quality. Similarly such characters as high grain quality, high-yielding power and strength of straw can be introduced into a wheat defective in these characters.

Some examples of the use of hybridization in producing new wheats will give an idea of the value of the process. Two of the highest-yielding wheats in the alluvium, namely, Punjab Type 9, and Muzaffarnagar are deficient in quality. Some of our Pusa selections, on the other hand, possess grain of exceedingly high quality, but their yielding power is only moderate. Suitable crosses were made between these two high-yielding wheats of poor quality and two wheats with very high quality but lower yield. In the third and fourth generations of the progeny of these crosses, we have been able to select and fix wheats which possess the high-yielding power of one parent with the high-grain quality of the other. We thus possess as it were Muzaffarnagar and Punjab No. 9 with high-quality grain instead of low; and we have been able to increase the value of their grain by about eight annas a maund. It is expected that the new fixed wheats from these crosses will be found suitable for large tracts of the Punjab and the United Provinces. Some of them are being grown this year at Cawnpore under canal irrigation by Mr. H. Martin Leake, the Economic Botanist to the Government of the United Provinces, and give every promise to surpass in yield any other wheats in cultivation there.

Some of the most interesting hybridization work at Pusa consists in breeding rust-resistant wheats and in increasing the standing power of the straw. At present the yield of wheat at Pusa is limited by both these factors. Till we get wheats with stronger straws, we cannot increase the present yields. It is also desirable to increase the resisting power to rust.

Out of the large number of wheats grown at Pusa one known as "American Club" received from England proved most resistant to rust under Indian conditions. Unfortunately, however, it comes into ear much too late to be used as a parent and at a period in the hot weather when crossing is the out of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

question. This difficulty has been got over as follows. Last spring the wheats on which we desired to cross American Club were sent to Cambridge and grown by Professor Biffen on the University farm as spring wheats. While we were on leave in June, these Indians were crossed on to American Club and other resistant wheats at Cambridge and the hybrid seeds were sent out by Professor Biffen in time for sowing at Pusa in October. The first generation has now yielded seed, and next year the isolation of new wheats with the rust-resisting power of American Club will begin.

V. THE MILLING AND BAKING QUALITIES OF INDIAN WHEATS.

Wheats differ to a great extent in the ease with which they are ground in the mill and also in the amount and quality of the resulting flour. It is obvious that reliable information on such matters can only be obtained by actually milling and baking a sample of wheat. For this reason milling and baking tests are essential in wheat improvement. In the conduct of this portion of the work we have been fortunate enough to secure the active co-operation of the highest authority in the Empire on milling and baking questions, namely, Mr. Humphries of Weybridge, a former President of the Incorporated National Association of British and Irish Millers. Mr. Humphries was mainly responsible for bringing about the general acceptance of the new form of contract under which Indian wheat is now sold in England and under which wilful adulteration before shipment has been practically prevented.

From the milling point of view the desirable characteristics of a wheat are that it should be free from admixture with dirt and other seeds, that it should be well grown, uniform in colour and consistency, that it should have a thin skin, absorb a large quantity of water before grinding, that it should mill freely and allow the separation of bran and flour to be made without excessive grinding. From the baking point of view the resulting flour should be of good colour (preferably greyish white) and should yield stable resilient dough and large well-shaped loaves.

Some of these desirable qualities are already possessed by many

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Indian wheats, namely, a great capacity for absorbing water in milling and a high percentage of flour. Their chief undesirable characters are frequent unevenness in texture and colour and the want of resiliency in the dough leading to small loaves with very poor looking crusts and bad flavour. In consequence, Indian wheats cannot be made into bread by themselves, but have to be blended with strong Canadian and Russian grades.

In improving the wheats of India for the export trade we have set before us a somewhat high standard, namely, the production of wheats at least equal to any on the English Market. Taking into account all the factors I think we can fairly claim success as far as the wheats grown at Pusa are concerned. We have succeeded in growing absolutely uniform wheats high in nitrogen with firstrate milling qualities and with high percentages of flour. The loaves made are of the same class as those made from the strongest Canadian and American grades, but are not quite so large as those given by Manitoba wheat. On the other hand our best Pusa wheats absorb more water in milling than the Manitoba grades and give a higher percentage of flour. During the last two years the new Pusa wheats sent for testing to England have been compared with the best Canadian Spring wheats with what results will be evident from the following extract from Mr. Humphries' last report:—

"The three lots, Nos. 100, 101 and 106 are very beautiful wheats also. On appearance only there is little to choose between them. If anything 106 may be the best looking. These three and Pusa 4 all behave very well indeed in the milling processes. The flours they all yield are granular, that is to say, they are bread flours rather than biscuit or pudding flours, and should be judged by comparison with hard spring wheat flours from Minneapolis or Manitoba rather than by comparison with Muzaffarnagars or similar wheats. They are all flours possessing great potentialities as regards baking value, which can be developed by proper treatment during milling and baking on the special lines mentioned hereinbefore. Without this special treatment they behave very well in the dough and produce loaves of fair but not great volume, and of firstrate appearance and flavour. They

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

behave like Manitoban good grade wheats produced in a dry season. That is to say, they like such Manitobans, respond very markedly to the addition of malt extract and "yeast foods" and the volume of the loaf can be increased very greatly by the use of the right malt extract. They seem to be possessed of very good qualities, capable, under favourable conditions, of yielding extremely good results.

"I have not enough of these varieties left to see how they behave in combination with other wheats, but I believe they would do very well indeed under such conditions. At any rate, I would, as a buyer, be prepared to pay substantially more money for them than for any of the ordinary Indian wheats of commerce."

Translated into money the improved Pusa wheats are worth from 8 to 10 annas a maund more than the ordinary wheats of commerce. When we consider that the annual export trade in Indian wheat amounted in 1904-05 to over 2,000,000 tons valued at 18 crores of rupees it is clear that a much smaller general improvement than has already been obtained would greatly benefit the cultivator and the merchant. It is bound to be to the advantage of all concerned to deal in an improved product.

VI. The Consumption of Wheat in India.

By far the largest portion of the wheat grown in India is consumed in the country. Anything from 80 to 90 per cent. of the total crop is used locally, the balance being exported. The question naturally arises what wheats are preferred by the people for their own food. From the point of India this question is more important than that of the wheats in greatest demand on the English market. Fortunately for the improver of Indian wheats the same class of produce best suits the local demands of India and also the requirements of the Home millers. If we can improve the wheats in greatest demand in India for food we shall at the same time fulfill the demands of the trade. There is therefore only one objective.

During the past four years we have constantly made enquiries in the villages of the Plains as to the wheats preferred by the cultivators for their own food. They invariably show us hard reds or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

hard whites and frequently say that the soft whites are deficient in feeding value. From the chemical point of view their choice is sound as the hard whites and hard reds are richer in proteids and therefore better and more sustaining food than the soft whites and soft reds.

Recently at the Allahabad Exhibition a group of cultivators interested in wheat-growing were asked to select from a set of samples the wheats they would prefer for their own consumption. Without hesitation they selected those which Mr. Humphries had found to be the best for bread-making in England and rejected those which only behaved in the tests like ordinary Indians. This group of cultivators are growing next season 50 maunds of the six best wheats we have so far produced. We mention this circumstance to show that there will be no prejudice on the part of the ryots against the appearance of our improved wheats.

VII. Improvement in the Yield of Wheat.

Great improvements are possible in the yield of wheat in India by the more skilful use of the means at present at the disposal of the cultivators. The average yield per acre in the botanical area at Pusa is more than twice that obtained by the people and similar results have been obtained in the botanical area of the Cawnpore Experiment Station under canal irrigation. The average yields at Pusa obtained by crop weighings on quarter acre plots in 1909 and 1910 is somewhere in the region of 30 maunds or 2,500 lbs. per acre. These yields have been obtained without manure, without rain or irrigation and on land which has been under wheat continuously for four years. There is no visible diminution in fertility but on the contrary the land is getting too fertile and there is a tendency for the wheat to grow too rank and tall and to be damaged by heavy winds at the time it comes into ear. At Cawnpore the results are similar and some of the new Pusa hybrids there are expected this year to give about 25 maunds (over 2,000 lbs.) to the acre. We believe similar results are possible all over the plains and that an increase of at least 50 per cent. in the outturn is possible in the alluvium in both the *rabi* and *kharif* crops. There are great trade possibilities involved in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

these matters for the reason that only the surplus production of wheat and other seeds is exported. Any increase therefore in the present crops will leave a far greater margin for trade and might even enable India to undersell her competitors in the seed markets of the world.

We will now deal with the methods of cultivation and soil management under which these high yields can be obtained continuously on the same land.

Hot weather cultivation. The exposure of the wheat lands by iron ploughs in the hot weather of April and May is, we consider, one of the chief causes of the increased yield and continued fertility of the wheat land. Exposure of the land is beneficial in two different ways. In the first place all the early monsoon rainfall is absorbed by the soil and the loose open surface soil enables water to reach the subsoil and to be stored up as it were for the next *rabi* crop. If the *rabi* stubbles were properly broken up before the monsoon in the plains, an enormous amount of the water which now runs off the hard surface into the rivers, would be absorbed by the soil. In this way the irregularities of the monsoon would be of less importance to India and less irrigation water would be required. The year 1908 was one of very short and badly distributed rainfall at Pusa, when about 22 inches fell during the whole year. In spite of this over 25 maunds of wheat to the acre were grown at Pusa without irrigation and without rain after sowing time. The cultivators' crops failed and a famine was declared in the District.

The second way in which the exposure of the soil in the hot weather is beneficial is in increasing the fertility of the land. Exposure of the soil to the hot weather acts as if the land had been manured and the explanatian of this increase in fertility is, we consider, a bacteriological one. As is well known the soil is exceedingly rich in bacteria of many different kinds some of which are essential to plants in breaking down organic matter for the production of nitrogenous salts which are taken up by the roots in the soil water. Besides these useful bacteria other bacteria and soil organisms sour the soil and destroy the useful bacteria. Exposure of the land has the effect of partially sterilising the soil

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and in destroying wholesale a large part of the soil flora. When the rains fall the spores of the various soil bacteria again become active, but it would appear that the new soil flora is more efficient than the old from the point of view of the plant.

Small iron ploughs are much more efficient instruments in exposing the land in the hot weather than the common country wooden plough. When the cultivators have been taught by example the real use of these ploughs, a great market is bound to arise in the plains and another outlet will be found for Indian steel. The cultivator already practices this to a limited extent and already appreciates the value of exposing his lands in the hot season. It will be a comparatively easy matter therefore to teach him to do this more efficiently than at present and to do it on a much larger scale with more effective implements.

Conservation of moisture. The next step in managing wheat lands in the alluvium is concerned with the conservation of moisture. Besides the hot weather cultivation one or two ploughings with iron ploughs in the breaks of the early part of the monsoon will enable more and more water to be taken up by the subsoil. After the end of July iron ploughs are given up and the wooden country plough is used instead as this packs the subsoil and also produces sufficient upper loose soil to take in more water. The beam is now also used after ploughing to prevent loss by evaporation in the breaks of the monsoon. After the sowing rains—the last of the monsoon shower of September—the land is finally levelled (or harrowed in case it is very heavy land) and left till sowing time. Sowing is done preferably in the morning behind the country plough and the land is immediately covered in with the beam which must be passed over the land several times. After the wheat begins to tiller the land is rolled once or twice and nothing more is done till harvest.

The essence of the process consists in absorbing as much water as possible in the monsoon and in taking steps not to lose it afterwards. Very little cultivation is done just before sowing time as at this period moisture is easily lost. The ryot commonly leaves his preparation for wheat till the last fortnight before sowing and during the process a large amount of moisture is lost. At Pusa

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

our tilth for wheat is obtained in the hot weather before the monsoon and never lost afterwards.

Green manuring. In getting land in a good state of cultivation for wheat and in improving its water-holding capacity we have found green manuring with *san* hemp the best method. After a crop of this is ploughed in green in the monsoon the land is much more easily worked and less force is required in ploughing the land after wheat. If after a few crops of wheat we find at Pusa that the supply of organic matter in the soil needs replenishment it will be easy to plough in a green crop of *san* and bring the land back again without omitting a single wheat crop.

The methods of cultivation and soil management we have indicated are capable of adoption throughout the plains with of course any necessary local modifications. We believe if these methods were carried out a great increase in crop production would be possible, less water would be required for irrigation and much more would be got out of the Indian monsoon.

The methods we have adopted are often referred to as dry farming methods. We prefer to regard them as merely the application of common sense to crop production in the plains.

VIII. Future Work.

It has already been shown that both in the yield and quality of wheat considerable progress has been made at two of the Experiment Stations in India. New wheats are now available which, if generally cultivated by the people in the way described above, would rapidly raise the quality and volume of the wheat exported from India. All this can be done with the means within the reach of the people. All that is required is greater care in cultivation and in the conservation of moisture. In bringing about these improvements our first task will be the conversion as it were of the Agricultural Department itself after which the active support of the bureaucracy will naturally follow. At this point the assistance and co-operation of the wheat merchants themselves will be necessary so that whole

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

shipments of improved wheats can be made and proper arrangements made for their purchase in India, for their sale in England and for making known their merits to the English millers. We have every reason to believe that the merchants concerned will give their hearty support in these matters and we believe that before very long the whole weight of the official influence in the country will be on the side of the Agricultural Department in placing the production of wheat and other crops on a higher plane than it is at present.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A NEW SNAKE FROM THE WESTERN HIMALAYAS. *TRACHISCHIUM QUINQUELABIALIS.*

BY

Major F. WALL, I.M.S., C.M.Z.S.

In 1909 I sent to the British Museum a *Trachischium* from Muktesar (circa 7,500 feet) which appeared a new species, but which I preferred at the time to regard as an aberrant *T. tenuiceps*.

Mr. Boulenger in acknowledging the specimen considered it a distinct species.

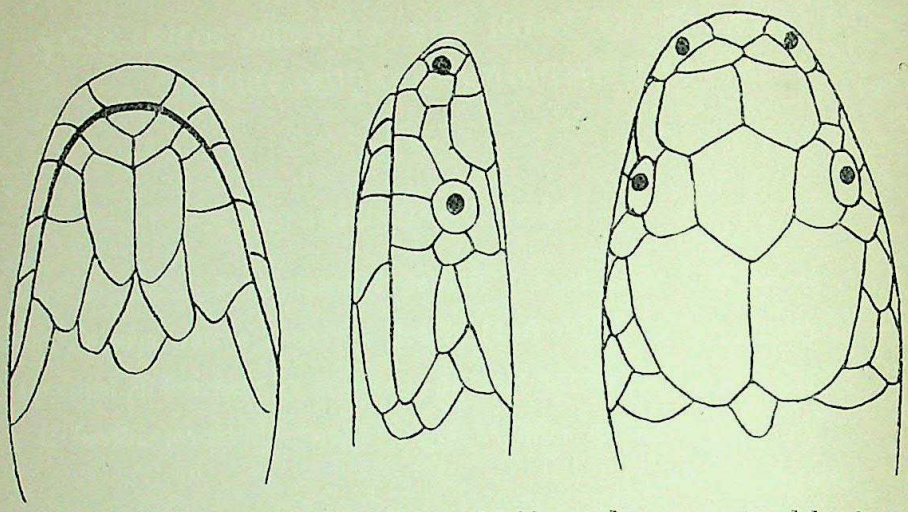
I have now obtained a second specimen which leaves no doubt in my mind that the species is one hitherto undescribed. This specimen was obtained from the Naini Tal District, exact locality and altitude uncertain, but one may infer the latter to be above 6,000 feet, since a specimen of the Himalayan viper (*Ancistrodon himalayanus*) was in the same bottle.

Only one specimen of this genus has ever been recorded from the Western Himalayas previously, *viz.*, *T. fuscum*, found by Dr. N. Annandale in Gilgit, and described by him as a new snake under the name *Ablabes gilgiticus* (J. A. S., Bengal, 1905, p. 210).

It appears to me that my new species resembles *T. tenuiceps* most closely, but differs in having only one postocular and only 5 supralabials. The temporal thus touches but one labial (the 5th), differing from all the other species in which it touches the 5th and 6th. In my first specimen the internasals were completely separated by the rostral, and the loreal shield found contact with the internasal, but in the second specimen the internasals are narrowly in contact, and do not meet the loreal. On the left side the præocular is partially confluent with the loreal in the second specimen.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Description : *Rostral.*—Touches 6 shields, and may extend back so as to completely separate the internasals. *Internasals.*—A pair; the suture between them $\frac{1}{3}$rd to $\frac{1}{4}$th, that between the præfrontal fellows. *Præfrontals.*—A pair; the suture between them subequal to the præfronto-frontal; in contact with internasal, (postnasal sometimes), loreal, præocular, and supraocular. *Frontal.*—Sutures subequal; breadth twice that of supraoculars, length one-fourth greater than supraoculars. *Nasals.*—Two, the nostril pierced entirely in the anterior. *Loreal.*—One, sometimes in contact with the internasal. *Præocular.*—One. *Postocular.*—One. *Temporal.*—One, in contact with only the 5th of the supralabial series. *Supralabials.*—5, the 3rd and 4th touching the eye; the 5th as long as the three preceding shields. *Sublinguals.*—Two pairs, the anterior larger. The posterior touches the 4th only of the infralabials. *Infralabials.*—4, the 4th largest, and in contact with two scales behind. *Costals.*—13 in whole body length. *Ventrals.*—141 and 142. *Anal* divided. *Subcaudals.*—38 and 39. *Colour*—Blackish-brown dorsally, each scale, especially those in the flanks rather lighter centrally. Belly nearly uniform white (yellowish?). Some sparse mottling occurs in its posterior half towards the median line and beneath the tail.

My second specimen measured $11\frac{3}{4}$ inches, the tail accounting for 2 inches.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

By

Colonel C. J. Bamber, F.L.S.,

Indian Medical Service.

Part IX.

(Continued from page 1102 of Volume XX.)

Herbs, erect, with Opposite Exstipulate Lobed Leaves.

Petals United.

Flowers Small, in Heads.

Dipsacus inermis, Teasel.
Dipsaceæ.
F. B. I. iii. 217.
Himalaya, 6-12,000 ft.
Simla, Mashobra (Collett).
Changlagalli (Douie).

large, stout, rough with stiff hairs, roughest under the flower heads: leaves 3-12 ins., lower leaves deeply divided, end lobe largest, upper, ovate or lanceolate or some divided into three lobes, shortly hairy on both surfaces, stalks dilated, united at the base; flowers white, small, many, in nearly round terminal long-stalked, solitary or several heads, 1 in. diam., surrounded by 6-8 spreading, leaf-like bracts, bracteoles or scales on the base of the head (receptacle) concave, abruptly narrowed in long, fringed, spine-like points, projecting above the flowers when in bud, calyx double owing to an epicalyx (involucel), calyx proper cup-shaped, hairy, 4-angled, 4-lobed on the achene, epicalyx 8-ribbed, surrounding the achene, corolla velvety, unequally 4-lobed, stamens 4, anthers protruding, stigma linear; achene with the 8-ribbed epicalyx, crowned with the calyx, which falls off later.

Dipsacus strictus,
Dipsaceæ.
F. B. I. iii. 217.
Himalaya, 7,000 ft.
Chamba.

very like the last species, but larger, more of the leaves undivided, flowers cream coloured, and fewer heads.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

FLOWERS SMALL, IN HEADS.

Scabiosa Olivieri, Scabious,
DIPSACEÆ.
F. B. I. iii. 219.
The Low Hills of Peshawar (Vicary)
Rawalpindi.
Hazara (Stewart).
The Park, Rawalpindi.
Baluchistan (Stocks).

small, annual, branched, hairy, stem leafy; leaves 2 by $\frac{1}{4}$ in., narrowly oblong, slightly toothed, or 4 by 2 in., deeply divided into pointed lobes; flowers purple, small, in few-flowered small terminal heads, bracts $\frac{1}{4}$ in., oblong-lanceolate, surrounding the heads, calyx of 2 portions, epicalyx (involucel) $\frac{1}{4}$ in. diam., 16-20 ribbed, calyx proper with short teeth and bristles $\frac{1}{3}$ in. barbed, brown, corolla tubular, 4-5 lobed, all equal, much shorter than the calyx-bristles, hairy without, stamens 4, style filiform; achenes crowned by the epicalyx and calyx-bristles, silky.

Scabiosa speciosa,
DIPSACEÆ.
F. B. I. iii. 219.
Himalaya, 7-9,000 ft.
Kashmir
Kagan (Douie).

medium size, branched, rootstock perennial; leaves 2 by $\frac{1}{3}$ in., oblong, pinnatifid at the base with small lobes; flowers mauve, small, in many-flowered large terminal, stalked, radiate heads, bracts $\frac{1}{2}$-$\frac{2}{3}$ in., narrowly oblong, involucel $\frac{1}{6}$ in., nearly bell-shaped, calyx-bristles nearly black, corolla with ray $\frac{3}{4}$ in., corolla without ray in the centre of the flower $\frac{1}{2}$ in.; achenes $\frac{1}{4}$ in., silky below, upper 8-ribbed, deeply pitted within the ribs; otherwise like the last species.

Bidens tripartita, Bur-Marigold.
COMPOSITÆ.
F. B. I. iii. 309.
Himalaya, 3-5,000 ft.
Dharmpur.

medium-size, annual, smooth, velvety above; leaves 3-5 in., digitately 3-5-lobed, lobes lanceolate, toothed, terminal longest; flowers yellow, small in discoid heads, $\frac{2}{3}$ in. diam. on short, erect stalks, bracts longer than the flowers, in 2 or 3 series joined below, outer green, longer than the flowers, inner thin; receptacle with narrow flat scales nearly as long as the flowers; calyx (pappus) of two barbed bristles on the achene, corolla-tubes narrow, dilated at the top, 5-toothed; style arms hairy; achenes $\frac{1}{4}$ in., smooth, wedge-shaped, barbed along the sides, bristles very short, two.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

FLOWERS SMALL, IN HEADS.

Bidens pilosa,
COMPOSITÆ.
F. B. I. iii. 309.
Var. pilosa proper.
The Plains to 6,000 ft.
Valleys below Simla (Collett).
Kasauli.

small, hairy or smooth; leaves 3-5 in., pinnate, leaflets 3-5, ovate, toothed; flowers tubular in the centre, along the edge supplied with white ligules or rays, pappus of 3 barbed bristles; achenes linear rough; otherwise like the last species.

Bidens Wallichii,
COMPOSITÆ.
F. B. I. iii. 309.
Var. bipinnata.
The Plains to 8,000 ft.
Simla (Collett).
Dewal (Douie).
Dharmpur.

very like the last species, but the leaves are twice pinnate, segments cut and lobed variously, and ligules yellow.

Glossogyne pinnatifida,
COMPOSITÆ.
F. B. I. iii. 310.
The Plains.

small, perennial, root spindle-shaped, woody, stem and branches slender, forked, sparingly leafy; leaves 1-2 in., with the stalk, triangular, divided into linear, pointed segments, few, often turned down, leathery, flowering branches 6-12 in., straight, stiff, grooved; flowers yellow, small, in few small heads, $\frac{1}{4}$ in. diam., arranged in flat-topped clusters, heads with flowers all tubular or central ones tubular and outer ligulate, receptacle small, flat, scales thin, bracts in 2-3 series, $\frac{1}{6}$ in. blunt, narrow, joined below, pappus (calyx) of 2 bristles, rough from reversed hairs, corolla tubular, 5-toothed, anther bases blunt, style arms with long hairy tips; achenes $\frac{1}{4}$-$\frac{1}{3}$ in., deeply grooved, black.

STAMENS FOUR.

crophularia lucida,
SCROPHULARIACEÆ.
F. B. I. iv. 256.
Himalaya, 8-10,000 ft.
Kashmir.

medium-size, perennial, stout, stems somewhat 4-angled, smooth or glandular, velvety; leaves 1-2 in., singly or doubly pinnately divided, segments spreading very unequal, oblong, ovate or lanceolate margins deeply cut or toothed, horizontal; flowers

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

STAMENS FOUR.

small, dingy green-purple in opposite stalked loosely spreading clusters, forming terminal branching racemes, bracts linear, calyx 5-fid, lobes half as long as the corolla, rounded, margin thin, corolla-tube $\frac{1}{4}$-$\frac{1}{3}$ in., broad, very short, lobes 5, two upper longer than the others, lowest spreading, stamens 4, lin. unequal pairs, turned downwards, hardly projecting out, staminode round or kidney-shaped: capsule round, few seeded: seeds oblong, deeply pitted.

Scrophularia variegata, SCROPHULARIACEÆ. F. B. I. iv. 256. Himalaya, 9-14,000 ft. — very like the last species, but the leaves are less pinnatifid, being only pinnatifid at the base with blunt recurved lobes.

Scrophularia scabiosæfolia, SCROPHULARIACEÆ. F. B. I. iv. 256. N. West Frontier Hills near Peshawar (Vicary, Aitchison). Chakwal (Douie). — one variety like a *Scabiosa* with a woody root-stock and many radical pinnatifid leaves and a scape-like branching raceme, the other very like *Scrophularia lucida*, but with very minute flowers $\frac{1}{10}$ in.

Veronica verna, — see Herbs, Erect, Opposite, Exstipulate, Simple, Entire.

Leptorhabdos Benthamiana, — see Herbs, Erect, Alternate, Exstipulate, Lobed.

Pedicularis pectinatas, — see Herbs, Erect, Alternate, Exstipulate, Lobed.

Pedicularis tennirostris, — see Herbs, Erect, Alternate, Exstipulate, Lobed.

Pedicularis gracilis, — see Herbs, Erect, Alternate, Exstipulate, Lobed.

Pedicularis porrects, — see Herbs, Erect, Alternate, Exstipulate, Lobed.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

STAMENS TWO.

Martynia diandra, Tiger or Devils Claw,
PEDALLIACEÆ.
F. B. I. iv. 386.
Himalaya, 1-2,000 ft.
Dunera, Gurdaspur District

large, rough, stem succulent, an American weed; leaves 5-10 in. diam., round, or angled, thin, long-stalked, sometimes upper alternate; flowers $1\frac{1}{2}$-3 in., pale pink, showy in axillary and terminal clusters, calyx 4-5 lobed, corolla bell-shaped, and inflated on one side, somewhat 2-lipped, 5-lobed, stamens 2, capsule 1 in., woody covered with a soft coat soon falling off, beaked by strong curved spines, that catch on to any passing animal.

STAMENS FOUR.

Sesamum indicum,

see Herbs, Erect, Opposite, Exstipulate, Simple, Toothed, Corolla two-lipped, Stamens four.

Verbena officinalis, Vervain,
VERBENACEÆ.
F. B. I. iv. 565.
The Plains to 7,000 ft.
Simla (Collett).
Phalia in the Gujrat District.
Kahuta. Murree (Douie).
Hazara (Barrett).

medium-size, perennial, nearly smooth, stems 4-sided, branching; leaves 2-4 in., variously lobed, sometimes ovate, toothed, base narrow, lower leaves stalked, upper sessile, usually divided into three; flowers $\frac{1}{4}$ in., blue or lilac, sessile in long slender bracteate spikes, branching, 3-10 in. long, calyx $\frac{1}{16}$-$\frac{1}{12}$ in., tubular, glandular-hairy, 5 minute teeth, corolla hairy, tube nearly cylindric, longer than the calyx, lobes 5, spreading, stamens 4, in unequal pairs, enclosed in the corolla, style short, stigma round; fruit of 4 nutlets enclosed in the calyx; nutlets $\frac{1}{16}$ in., oblong, 3-ribbed, inner faces with minute white flaking cells.

Leonurus gardiaca. Motherwort.
LABIATÆ.
F. B. I. iv. 678.
Himalaya, 6-10,000 ft.
Narkanda (Collett).

large, root stock and stem stout; leaves velvety to felted beneath, lower 5 by 3 in., ovate lanceolate or round, toothed or deeply and irregularly cut into several coarsely toothed lobes, long stocked, upper 1-3 in. narrow, lobed or nearly undivided; flowers $\frac{1}{2}$ in. long, pink, in many dense axillary clusters forming long terminal spikes, bracts large, lower stalked, bracteoles spinous, calyx $\frac{1}{6}$ in., top-shaped, 5-nerved, 5-toothed, teeth triangular, spines long, corolla-tube ringed within, 2-lipped,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

STAMENS FOUR.

upper lip erect, hooded, silky, lower spreading, 3-lobed, mid-lobe longest, stamens 4, ascending under the upper lip, nutlets 4, sharply 3-angled, smooth.

PETALS NONE.

Galtha palustris, see Herbs, Erect, Alternate, Exstipulate, Lobed.

COMPOUND LEAVES.

Biophytum sensitivum, see Herbs, Erect, Opposite, Stipulate, Compound.

Bryophylium calycinum, see Herbs, Erect, Opposite, Exstipulate, Simple, Toothed.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Reseda pruinosa, RESEDACEÆ. F. B. I. i. 181. Hills of the Western Punjab (Vicary). small, perennial, curved with minute projections, leaves 1-2 in., lower leaves lanceolate, upper cut into linear segments, stipules glandular, minute flowers very small, nearly sessile in terminal dense racemes, bracts awl-shaped, soon falling off, minute, calyx persistent, sepals 4-7, petals 4-7, stalked, unequal, much divided, that on the posterior side with a membrane above its stalk, stamens 10-40, stigmas sessile; capsule oblong or ovoid, short, widely open, many sided, seeds many, kidney-shaped.

Oligomeris glaucescens, *Bui.* RESEDACEÆ. F. B. I. i. 181. The Plains. Shahpur (Douie). Baluchistan (Boissier). small, annual, with a bluish waxy gloss, much branched; leaves 1-2 in., narrowly linear, in tufts, stipules minute, awl-shaped; flowers minute, greenish-white in bracteate dense-flowered, terminal spikes, calyx of 4 sepals, petals 2, alternate with the posterior sepal, stigmas sessile; capsule very small, 4-lobed, membranous, seeds many, minute, shining.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Portulaca oleracea, see Prostrate Herbs, Alternate, Stipulate, Simple.

Crotalaria humifusa, see Prostrate Herbs, Alternate, Stipulate, Simple.

Crotalaria prostrata, see Prostrate Herbs, Alternate, Exstipulate, Simple.

Crotalaria hirsuta, see Prostrate Herbs, Alternate, Stipulate, Simple.

Crotalaria alata, see Shrubs, Alternate, Stipulate, Simple.

Crotalaria mysorensis, LEGUMINOSÆ. F. B. I. ii. 70. The Plains to 4,000 ft. Hazara (Douie).

medium-size, annual, much branched, covered with long silky hairs; leaves 1-3 in. long, linear-oblong, rounded at both ends, thinly silky, stipules small, linear, persistent; flowers $\frac{1}{2}$-$\frac{3}{4}$ in. long, yellow in terminal and lateral, stalked racemes, 6-9 in. long, bracts lanceolate, leafy, calyx $\frac{1}{2}$-$\frac{5}{8}$ in. long, silky; teeth 5, all long, upper lanceolate, lower linear, corolla not projecting beyond the calyx, petals 5, upper (standard) broad, round, stalked, lateral oblong, shorter, lower two united to form the keel, equal to the lateral, much curved in, and beaked, stamens 10, united behind, style long, abruptly incurved at the end, bearded above; pod nearly sessile, twice the length of the calyx, oblong, smooth, 20-30 seeded.

Crotalaria sessiliflora. LEGUMINOSÆ. F. B. I. ii. 73. The Plains to 6,000 ft. Simla, Chadwick Falls Waterworks Road (Collett). Jakku above the Ladies' Mile. Hazara (Douie).

medium-size, annual, stem unbranched or branched, silky; leaves 2-6 in., linear or lanceolate, narrowed to both ends, thick, smooth above, thinly silky below, stipules bristle-like, very small; flowers $\frac{1}{3}$ in., blue, rarely yellow, not projecting beyond the calyx, sharply bent down, lower flowers often axillary, upper crowded in racemes, 2-20 flowered, racemes 6-9 in. long, bracts and bracteoles bristle-like, persistent, calyx $\frac{3}{8}$-$\frac{1}{2}$ in. long, brown silky, teeth all short pointed, upper $\frac{1}{8}$ in. broad, corolla smooth; pod sessile, smooth, $\frac{1}{2}$ in., seeds 10-15; otherwise like the last species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Indigofera linifolia, see Prostrate Herbs, Alternate, Stipulate, Simple.

Indigofera cordifolia, LEGUMINOSÆ. F. B. I. ii. 93. The Plains to 4,000 ft. in the Chenab Valley. Kahuta (Douie). Baluchistan (Baker).

small, annual, much branched, spreading, covered more or less with long white hairs; leaves $\frac{1}{4}$-$\frac{3}{4}$ in., ovate, heart-shaped, apex a nearly straight edge, with a large stiff point, densely hairy beneath, stipules minute, bristle-like; flowers $\frac{1}{8}$ in., red, four to eight crowded together in a sessile cluster, calyx 5-toothed, tube short, teeth long, bristle-like, very hairy, corolla not projecting beyond the calyx, petals 5, upper one (standard) rounded, two lower ones united (keel) straight, not beaked, spurred on each side at the base, stamens 10, upper one free, the others united, anthers tipped with a minute point, style short, curved inwards; pod $\frac{1}{4}$ in. long or less, oblong, cylindrical, beaked, 2-seeded seeds ovate, yellow.

Uraria picta, see Herbs, Erect, Alternate, Stipulate, Compound, Leaflets many.

Uraria lagopus, see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Uraria neglecta, see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Alysicarpus monilifer. see Prostrate Herbs, Alternate, Stipulate, Simple.

Alysicarpus hamosus. see Prostrate Herbs, Alternate, Stipulate, Simple.

Alysicarpus rugosus. see Prostrate Herbs, Alternate, Stipulate Simple.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Sida grewioides,
MALVACEÆ.
F. B. I. i. 323.
The Plains.
Baluchistan (Boissier).

medium-size, grey-felted; with star-shaped hairs; leaves ½ in. long, oblong-ovate, blunt-pointed, round-toothed, downy on both surfaces, leaf stalk shorter than the blade, stipules linear, awl-shaped, nearly equal to the leaf stalk; flowers small, ⅓ in. diam., yellow or white solitary or in pairs on a common stalk, shorter than the leaf stalks, calyx of 5 angular sepals, angular-tubular below, petals 5, united together below and with the staminal-tube, staminal-tube dividing above into numerous filaments, styles 7-8; fruit of 7-8 carpels, carpels wrinkled, bristle-topped and beaked, beaks converging, seed one in each carpel. The flowers open at noon.

Abutilon graveolens,
Bara banghi,
MALVACEÆ.
F. B. I. i. 327.
The Plains.
Bhansi, Gurgaon.
Baluchistan (Masters)

large, perennial, fresh leaves smell unpleasantly, branches covered with velvety glands and hairs; leaves 2-3½ in., round heart-shaped, sometimes lobed, abruptly long-pointed, velvety on both surfaces, leaf-stalk almost as long as the blade, stipules linear sickle-shaped, turned back, soon falling off; flowers large, orange with dark centre, pink and turned back when old, on axillary and terminal stalk, as long as the leaf-stalks, and jointed above the middle, calyx of 5 sepals, ovate, long-pointed, tubular below, densely velvety, petals 5, broadly heart-shaped, united together below and with the staminal-tube, staminal-tube dividing above into many filaments, styles 20 or more; fruit of 20 or more carpels, rounded hairy, about equal in length to the calyx, which is enlarged in fruit, not bristle-pointed, separating from the central column, each carpel 2 or more seeded, seeds kidney-shaped. The flowers open in the evening; a fibre is obtained from the stem; the roots, leaves and seeds are medicinal.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Abutilon avicennæ,
MALVACEÆ.
F. B. I. i. 327.
The Plains to 5,000 ft.
Kashmir.

medium-size, annual, leafy, softly felted; leaves 3-4 in., round heart-shaped with a long point, leaf stalk 3 in. long; flowers yellow, scarcely longer than the sepals on solitary, axillary stalks 1 in. long, sepals nearly divided to the base, ovate, short-pointed, staminal-tube very short, carpels 15-20, much longer than the sepals, oblong, hairy or velvety with 2 long spreading bristles, seeds soft with scattered hairs; otherwise like the last species.

Plumbago zeylanica,
PLUMBAGINACEÆ.
F. B. I. iii. 480.
The Plains to 5,000 ft.
Giri and Sutlej Valleys (Collett).
Koti.
Choa Saidan Shah.
Mator near Kahuta (Douie).
Baluchistan (Boissier).

large, perennial, stems several, rambling, leaves 2-3 in., ovate, short-pointed, smooth abruptly, narrowed into the stalk, leaf-stalk $\frac{3}{4}$ in., stem-clasping, stipules round, flat, soon falling off; flowers $\frac{3}{4}$ in. long, bluish-white in bracteate, often branched, glandular spikes, 4-12 in. long, bracts in., ovate, short-pointed, calyx $\frac{1}{3}$-$\frac{1}{2}$ by $\frac{1}{10}$ in., tubular, covered with stalked glands, 5-ribbed and toothed, teeth very short, corolla flat-topped, circular, tube $\frac{3}{4}$ in. long, lobes 5, $\frac{1}{3}$ in., nearly equal, round, spreading, stamens 5, free from the corolla, opposite the lobes, dilated at the base, anthers protruded, style 1; slender with 5 branches above; capsule thin, enclosed in the persistent calyx, opening transversely near the base, seed one.

PETALS NONE.

Polygonum orientale,
POLYGONACEÆ.
F. B. I. v. 30.
The Plains to 5,000 ft.
In swamps.

large, annual, velvety or silky-hairy, stems grooved, branches hollow-stemmed; leaves 6-9 by 2-5 in., ovate or ovate heart-shaped, long-pointed, grey with hairs, leaf-stalks 1-4 in., sometimes winged, stipules tubular, short, hairy, ending abruptly, mouth thin, papery, or dilated, green, curved back; flowers large, red, white or green, in crowded erect or drooping cylindric racemes 2-4

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

in. long, forming large terminal branched clusters, bracts hairy, ovate, flat, 3-6 flowers in the axil of each bract, calyx (perianth) of 4-5 segments, petals none, stamens 7 or 8, alternating with small honey secreting glands, enclosed in the calyx, styles 2, united half way up ; nut round, $\frac{1}{8}$ in. diam., flattened with concave faces, coat very thick, black, shiny.

Polygonum virginianum, POLYGONACEÆ. F. B. I. v. 31. Himalaya. Kashmir. Jhelum River 2-4,000ft. Pir Panjal Range 7-10,500 ft. (Stewart).

large, perennial, rough hairy, branches hollow-stemmed ; leaves 4-10 in., broad and tapering equally to either end, thin, leaf-stalk $\frac{1}{2}$-1 in., stipules $\frac{1}{4}$-$\frac{1}{2}$ in., tubular roughly hairy, mouth abrupt, bristly ; flowers in very long slender long stalked racemes, 6-16 in., bracts tubular, bristly, $\frac{1}{4}$-1 in. apart, 2-flowered, bracteoles narrow-transparent, calyx 4-fid, thin, stamens 5, alternating with glands, styles 2, long, stiff, hooked, persistent, stigmas undivided ; nut oblong, with rounded ends, flattened, pale brown, as long as the persistent styles.

Polygonum glabrum, POLYGONACEÆ. F. B. I. v. 34. The Plains to 6,000 ft. Simla in ditches (Collett).

large, stem thick, often red, branched ; leaves 4-8 in., lanceolate or linear-lanceolate with a fine long point, minutely glandular or not, stalked stipules $\frac{3}{4}$ in., tubular, smooth, thin, not fringed; flowers pink or white in slender erect racemes, 2-4 in. long, forming a terminal branched cluster, bracts smooth, tubular, tip oblong or rounded, calyx 5-fid, varying in size, stamens 6-8, styles 2 usually sometimes 3, united below the middle; nut rounded, bi-convex, 3-angled with 3 styled flowers, black, shining.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Polygonum lapathifolium, or simlense,
POLYGONACEÆ.
F. B. I. v. 35.
The Plains to 7,000 ft.
Martiana, Theog (Collett).
Shahpur District (Douie).

medium-size, annual, branched, smooth below, rough with glands above; leaves 3-6 in., lanceolate finely pointed, narrowed to the base, glandular, leaf-stalk short, narrowly winged, upper leaves sessile, margins, midrib and nerves somewhat hairy, stipules tubular, not fringed; flowers red, $\frac{1}{10}$-$\frac{1}{8}$ in. in dense-flowered, erect or nodding racemes, $1\frac{1}{4}$-2 in. long, axillary, or forming terminal branching racemes, bracts tubular, short, not bristly, calyx 4-fid, glandular, stamens 6, styles 2, joined together close to the base; nut round, flattened, minutely dotted.

Polygonum persicaria,
Knot grass,
POLYGONACEÆ.
F. B. I. v. 35.
Kashmir (Falconer).
Baluchistan (Lace).

very like the last species, but the leaves are without glands, stipules hairy, fringed, bracts bristly, flower stalks smooth, and calyx without glands.

Polygonum minus,

see Prostrate Herbs, Alternate, Stipulate, Simple.

Polygonum stagninum,
POLYGONACEÆ.
F. B. I. v. 37.
The Plains.

small, branched or not, smooth below and hairy above; leaves 3-5 in., lanceolate or linear-lanceolate, long-pointed, velvety with flattened down hairs on both surfaces, glandular or not beneath, stipules tubular, with flattened down hairs, bristles shorter than the tube; flowers white in straight, erect, stout, or slender, long and strong stalked racemes, bracts enclose many flowers, rough with long bristles, calyx of 4-5 segments, without glands, stamens 5-8, styles 3; nut 3-angled, intensely black.

Polygonum barbatum,
POLYGONACEÆ.
F. B. I. v. 37.
The Plains.

very like the last species, but smoother, the stipules more bearded, the racemes long, weak and slender, the bristles of the bracts shorter and weaker.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Polygonum hydropiper, Water-pepper.
Pani-maricha.
POLYGONACEÆ.
F. B. I. v. 39.
The Plains to 7,000 ft.
Simla, Nal Dehra (Collett).
Hazara (Barrett).

medium-size, annual, stout, smooth, stems sometimes prostrate and rooting at the joints, often glandular, joints often swollen, branched; leaves 2-3 in., lanceolate or oblong-lanceolate, narrowed to the base, dotted with glands, midrib with minute hairs, stipules tubular, $\frac{1}{3}$ in., smooth or minutely hairy with flattened hairs, swollen out near the middle, fringed with short bristles; flowers pink or red in very slender drooping zigzag racemes, 2-3 in. long, with gaps along the raceme and leafy at the base, bracts smooth, with or without glands, tubular, mouth naked or minutely bristly, calyx of 5 segments, with glands, stamens 6, styles 2 or 3, ununited nearly to the base; nuts minutely dotted, in the 2-styled flowers circular and flattened in the 3-styled, 3-angled.

Polygonum flaccidum,
POLYGONACEÆ.
F. B. I. v. 39.
The Plains to 4,000 ft. in wet places.

very like the last species, but larger with longer, broader, and more pointed leaves.

Polygonum glaciale,
POLYGONACEÆ.
F. B. I. v. 41.
Himalaya 8-12,000 ft.
Kashmir.

very small, annual, weak, smooth, nearly succulent, branches spreading from the root; leaves $\frac{1}{2}$-$\frac{3}{4}$ in., broadly ovate, apex blunt, long stalked, winged above only, stipules short, smooth, cup-shaped, 2-lobed or not; flowers minute, white or pale purple in sessile or stalked heads $\frac{1}{6}$-$\frac{1}{4}$ in. diam., stalk minutely glandular at the tip, bracts broadly ovate, blunt, smooth, flat, calyx 4-5 lobed, transparent, lobes nearly equal, blunt, stamens 5, no glands, styles 3, united; nut minute, closely included in the calyx-tube, black, striated.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Polygonum alatum, POLYGONACEÆ. F. B. I. v. 41. The Plains from 2-10,000 ft. Simla (Collett).

small to medium-size, annual, very variable, the smaller forms like the last species, but with short broad-winged leaf-stalks; leaves in the small form $\frac{1}{4}$-$\frac{1}{2}$ in., in the large 1-3 in., broadly ovate, smooth, rarely hairy, blunt or short-pointed, abruptly or gradually narrowed into a broadly winged and sometimes eared leaf stalk, stipules tubular, hairy or glandular below, not fringed with bristles; flowers minute, white, purplish or red in heads, $\frac{1}{5}$-$\frac{1}{2}$ in. diam., heads in the axils of leaves on stalks, glandular-hairy at the top, bracts flat, smooth, calyx 4-5-fid, stamens 6-8, style long with one or two arms, stigmas rounded; nut enclosed in the calyx, 3-angled, or flattened circular, minutely dotted.

Polygonum strigosum, see Prostrate Herbs, Alternate, Stipulate, Simple.

Polygonum sagittatum, see Prostrate Herbs, Alternate, Stipulate, Simple.

Polygonum alpinum, POLYGONACEÆ. F. B. I. v. 49. Himalaya 7-12,000 ft. Kulu to Kashmir (Thomson).

large, rootstock perennial, stem annual, grooved, pale, smooth or young parts softly velvety; leaves 3-5 in., lanceolate or linear-lanceolate, long-pointed, smooth, short stalked, stipules long, tubular, loose, upper part soon falling off, not bristly: flowers $\frac{1}{12}$-$\frac{1}{6}$ in. diam., white or pale pink, numerous in terminal crowded broad pyramidal branching racemes, 12 in. long or more, bracts short, blunt, flower stalks much longer than the bracts, jointed close to or further from the flower, calyx 5-segmented, segments nearly divided to the base, inner segments broad tipped, stamens 8, rarely less, alternating with glands when present, styles 3; nut $\frac{1}{6}$ in. long, shining, pale, sharply 3-angled, longer than the calyx. Aitchison states that it is eaten raw and cooked, and tastes like rhubarb.

Polygonum polystachyum, see Shrubs, Erect, Alternate, Stipulate, Simple.

Polygonum tortuosum, see Shrubs, Erect, Alternate, Stipulate, Simple.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULTE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Polygonum sibiricum, POLYGONACEÆ. F. B. I. v. 52. Himalaya 11-12,000 ft. Kangra (Edgeworth).

very small, perennially rooted, stem stout, branches many, spreading or erect; leaves 1-3 by $\frac{1}{10}$-$\frac{1}{4}$ in., narrowly linear, blunt pointed, two processes sticking out at the base, leaf stalk thick, stipules tubular, short, thin and papery; flowers $\frac{1}{10}$ in. long, pink in heads $\frac{1}{6}$-$\frac{1}{2}$ in. diam., forming terminal branched racemes, shorter than the leaves bracts minute, flower stalks short or long calyx in five segments, segments broadly oblong, stamens 5-8, short, with or without alternating glands, styles 2-3; nut 3-angled, not tightly enclosed in the calyx, oblong-ovate, black, shining, equal in length to the calyx. This plant is eaten by the Thibetans.

Fagopyrum esculentum, Buckwheat, *Phaphra, kultu, kathu.* POLYGONACEÆ. F. B. I. v. 55. Himalaya 5-12,000 ft.

medium-size, annual, smooth, branched or not, cultivated and found as an escape; leaves 1-4 in. diam., triangular, heart-shaped at the base, short-pointed, stipules tubular; flowers small, white or pink in axillary or terminal heads forming stalked many-flowered cluster, $\frac{1}{2}$-$\frac{3}{4}$ in. diam., calyx of 5 segments, segments nearly equal, stamens 8, alternating with yellow sessile glands, styles 3; nut $\frac{1}{4}$-$\frac{1}{3}$ in., ovate with 3 sharp-angled, much longer than the calyx.

Fagopyrum cymosum, POLYGONACEÆ. F. B. I. v. 55. Himalaya 5-11,000 ft. Simla, in woods (Collett).

medium-size, root perennial, branched, slightly velvety; leaves 2-4 in. diam., broadly triangular, sharp-pointed, long stalked, upper leaves, narrower and stem-clasping; flowers white in racemes, 2-5 in. long, forming long stalked branching racemes, flower stalks jointed in the middle, otherwise like the last species.

Fagopyrum tataricum, *Ugal, kaspat.* POLYGONACEÆ. F. B. I. v. 55. Himalaya 3-12,000 ft.

very like *Fagopyrum esculentum* above and also cultivated, but taller, and the faces of the nut deeply grooved with rounded angles.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Rumex nepalensis, Dock,
POLYGONACEÆ.
F. B. I. v. 60.
Himalaya 4-9,000 ft. (12,000 ft. on the Chenab, Stewart).
Simla (Collett).
Murree (Douie).

large, perennial sometimes, stout, branched; radical leaves 6-14 by 3-5 in., oblong, ovate-oblong or triangular-ovate, short-pointed or blunt, base broadly or narrowly heart-shaped and stalked, upper leaves not stalked and smaller, uppermost sessile and lanceolate, stipules tubular, not fringed soon disappearing; flowers small, green, often turning red, 2-sexual, in circular clusters at intervals along, nearly leafless racemes calyx of 6 circular sepals, 3 outer not enlarging, 3 inner enlarging in fruit, with a tubercle in the centre and fringed with hooked teeth, stamens 6, styles 3, stigmas fringed, terminal; nut brown sharply 3-angled, enclosed in the three enlarged hook-fringed and net-veined sepals.

Rumex hastatus,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Rumex acetosa,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Rumex vesicarius, Bladder Dock, Sorret,
Katta mitha, saluni, chuka.
POLYGONACEÆ.
F. B. I. v. 61.
The Salt Range Trans-Indus Hills.
Baluchistan (Hughes-Buller).

small, annual, pale green, smooth, branches in pairs; leaves 1-3 in., ovate or oblong, base wedge shaped, rarely heart-shaped or terminating in two sharp angles, stipules tubular, not fringed, soon disappearing; flowers small, pink or white, male and female separate, in terminal short leaf opposed leafless racemes, 1-1½ in. long, flowers on jointed or unjointed stalks, calyx of 6 circular sepals, inner 3 much enlarged in fruit, thin, 2-lobed at each end, not fringed, stamens 6, styles 3, fringed, arising from the angles of the fruit, bent down; nut ½ in. diam., 3-angled.

Phyllanthus urinaria,
Huzur-mani.
EUPHORBIACEÆ.
F. B. I. v. 293.
The Plains.

medium-size to large, annual, rarely perennial, smooth, stem and branches angled, angles of branches, margins of leaves and sepals often minutely hairy; leaves ⅙-⅔ in., in two lines, overlapping, oblong or linear oblong, tip rounded or short-pointed, sessile, stipules target-shaped;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

flowers minute, green, axillary, nearly sessile, males and females on the same plant, solitary or clustered, male flowers, calyx of 6 circular sepals, stamens 3, rarely 5, more or less united at the base, female flowers, calyx of 6 oblong sepals, styles 3, with two hooked arms; capsule $\frac{1}{10}$ in., prickly, hard, brittle with three 2-valved lobes, seeds transversely furrowed. This plant is said to be used as a diuretic and as a cure for jaundice.

Phyllanthus simplex, see Shrubs, Alternate, Stipulate, Simple.

Phyllanthus niruri,
Sada, huzur-mani, jaraula.
EUPHORBIACEÆ.
F. B. I. v. 298.
The Plains to 3,000 ft.

small to medium-size, annual, quite smooth, branched from the base, stem naked below, branches angular slender leafy; leaves $\frac{1}{4}$-$\frac{3}{4}$ in., oblong or linear, tip rounded, blunt or sharp-pointed, thin, nearly sessile, pale green, often in two rows overlapping, bluish waxy gloss beneath stipules minute, awl-shaped; flowers green, very many, minute, shortly stalked, male flowers solitary, anthers 3, sessile on a short column, styles ununited, capsule round, hardly lobed, smooth, seeds with ribs and faint cross lines; otherwise like *Phyllanthus urinaria* (described above) and with the same medicinal properties.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Triumfetta pilosa, see Herbs, Erect, Alternate, Stipulate, Lobed.

Triumfetta rhomboidea,
Chikti,
TILIACEÆ.
F. B. I. i. 395.
The Plains to 5,000 ft.
Simla (Collett).
Koti.

medium-size to large, perennial, smooth, or velvety; leaves 2-3$\frac{1}{2}$ by 1$\frac{1}{2}$-3 in., broadly ovate, or 4-angled with the lateral angles blunt or heart-shaped, 3-7 nerved, apex short-pointed or 3-lobed, toothed, stipules ununited; flowers $\frac{1}{4}$ in., yellow in dense clusters, flower stalks short, buds oblong, club-shaped, pointed, sepals 5, oblong, concave pointed, petals 5, oblong, bristly at the base,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

stamens 8-15, style thread-like, stigma 5-toothed; capsule $\frac{1}{4}$ in. diam., round or ovoid, white-felted, prickly, spines $\frac{1}{10}$ in., hooked, smooth, not dilated at the base, seeds one or two in each cell.

Triumfetta rotundifolia, see Shrubs, Alternate, Stipulate, Simple.

Triumfetta annua,
Chikti,
TILIACEÆ.
F. B. I. i. 396.
The Plains to 5,000 ft.
Simla (Collett).
Koti.

medium-size, annual, smooth except for a line of hairs on one side, which alters at every joint; leaves 4-5 by 2-3 in., ovate, long-pointed, toothed, smooth except for a few scattered hairs, long-stalked, stipules awl-shapped; flowers $\frac{1}{4}$ in., orange on stalks, 3-flowered, $\frac{1}{2}$ in. long, opposite to the leaves, sepals shortly and sharply pointed, petals nearly equal to the sepals, stamens 10; fruit $\frac{1}{4}$ in., bluish-green waxy gloss, 4-celled, spines long, smooth, hooked; otherwise like *Triumfetta rhomboidea.*

Corchorus capsularis, Jute,
Harrawa,
TILIACEÆ.
F B. I. i. 397.
The Plains to 4,000 ft.
(Cultivated or escaped)
Thanesar (Edgeworth)

medium-size to large, annual, smooth; leaves 2-4 in, ovate-lanceolate, long-pointed, toothed, rounded at the base, the two teeth furthest back prolonged into tails, stalk $1\frac{1}{2}$ in., stipules thread-like, as long as the stalk; flowers small, $\frac{1}{2}$ in. diam. or less, yellow, one or two together on axillary or leaf opposed stalks, sepals 4-5, petals 4-5, without glands, stamens few or twice the number of petals, ununited, style short, stigma cup-shaped; capsule $\frac{1}{2}$ in. diam., nearly round, depressed at the apex, ridged, rough with hard tubercles, 5-celled, valves woody, without cross partitions, seeds few in each cell, brown, smooth, wedge-shaped. The fibre of the inner bark forms the jute of commerce.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Corchorus olitorius,
Jute, or Jew's mallow,
Banphal, koshta,
TILIACEÆ.
F. B. I. i. 397.
The Plains to 4,000 ft.

very like the last species, but the sepals are short-pointed, petals longer than the sepals, capsule 2 in., cylindric, beaked, 10-ribbed, 3-6-valved, valves with cross partitions between the seeds, beak long, erect, undivided. This plant is cultivated as a pot herb and also for its fibre.

Corchorus trilocularis,
Kaunti,
TILIACEÆ.
F. B. I. i. 397.
The Plains.
Phalia.
Gujrat Dist. (Douie).
Baluchistan (Lace).)

very like the last species, but is sometimes perennial and is indigenous, capsule 2-3 in., 3-4 valved, straight or curved, valves 3-4-angled, with partitions, rough, beak short, erect and undivided.

Corchorus fasicularis,
TILIACEÆ.
F. B. I. i. 398.
The Plains.

very like the last species, but the leaves are usually smaller, flowers 2-5 on one stalk, capsule $\frac{1}{2}$-$\frac{3}{4}$ in., 3 or 4 together, short, nearly cylindric, valves dawny, almost without partitions, seeds 3-angled, black.

Corchorus tridens,
TILIACEÆ.
F. B. I. i. 398.
The Plains.
Baluchistan (Boissier).

very like the last species, but the leaves are usually more linear, capsule 1-2 in., crowned by 3 spreading points with tufts of glandular hairs, valves without partitions, seeds with the ends abruptly cut off.

Corchorus acutangulus,
TILIACEÆ.
F. B. I. i. 398.
The Plains to 5,000 ft.
Simla below 5,000 ft.
(Collett).

very like the last species, but with broader leaves, capsules 6-angled with three angles winged, crowned by three more horizontal spreading points valves with or without partitions.

Reinwardzia trigyna, see Shrubs, Alternate, Stipulate, Simple.

Impatiens amplexicaulis, see Herbs, Erect, Opposite, Stipulate, Simple, Toothed.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Impatiens scabrida, GERANIACEÆ. F. B. I. i. 472. Himalaya 7-10,000 ft. Simla, rare. Mahasu, common (Collett). Murree (Douie).

large, annual, smooth or velvety, stems succulent, often much branched; leaves 2-6 in., ovate or lanceolate, long-pointed, toothed, teeth gland-tipped, sessile or narrowed into a short stalk, stipules of 2 large glands; flowers yellow, spotted with brown, 1¼ in. long without the spur, single on axillary, usually paired stalks, or on a common 2-6 flowered stalk, 1-2 in. long, stalk of each flower 1-2 in., bracts bristle-like, sepals 3, 2 lateral, minute greenish, one lower (lip) petal-like, coloured yellow, broadly funnel-shaped, abruptly contracted into a slender, cylindric, incurved hollow spur ½ in. long, petals 3, one upper (standard) very large circular with a small green horn-like process on the back, two lower (wings) with lateral lobes, short, rounded, terminal, much smaller oblong, stamens 5, anthers cohering above the 5-toothed stigma with filaments clasping the ovary; capsule 1-2 in. long, linear, cylindrical tapering, straight, ribbed, smooth or nearly so, 5-valved, the ripe valves if shaken curl up elastically and jerk out the many, scarcely tubercled, oblong seeds.

Impatiens amphorata, GERANIACEÆ. F. B. I. i. 475. Himalaya, 5-8,000 ft. Simla (Collett).

medium size, annual, smooth, slender or robust; leaves 3-6 in., lanceolate, round toothed, a bristle-like gland at the point of each rounded tooth, long-pointed, stalked, stipules of two sessile or stalked glands; flowers purple, 1-1¼ in. long less the spur, in racemes branched or not, or in umbel-like clusters, lip large deep broad, spur ⅓ in., standard tip crested, wings white on the lower half; capsule 1-1¼ in., otherwise like the last species.

Impatiens Edgeworthii, GERANIACEÆ. F. B. I. i. 476. Kulu (Edgeworth).

very like the last species, but with yellow and red streaked flowers, bracts broader, lip funnel-shaped flower main stalks clustered, nearly terminal.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Impatiens racemosa
GERANIACEÆ.
F. B. I. i. 479.
Himalaya, 5-8,000 ft.
Simla, Fagu.
Narkanda (Collett).

large, annual, smooth, slender, branched; leaves 3-9 in., lanceolate or oblong-lanceolate, long-pointed, round-toothed, teeth or sinus gland-tipped, leaf stalk ½-2 in., slender, stipules of two sessile or stalked glands or none; flowers small, ½ in. yellow in racemes or umbel like clusters, flower-stalks slender, ⅓ in. long, bracts persistent, ovate, gland-pointed, two upper sepals ovate or oblong gland-pointed, lower (lip) boat-shaped narrowed into a slender tapering, nearly straight spur, ⅓ in. long, upper petal (standard) not spurred nor winged, lateral petals (wings) darker spotted, with a long linear process descending into the spur; capsule ½-¾ in.; for other characters see the last species.

Impatiens laxiflora,
GERANIACEÆ.
F. B. I. i. 479.
Himalaya, 5-10,000 ft.
Simla, Hattu (Collett).

like the last species, but the leaves are usually smaller, leaf stalk longer, stipules always present, flowers slightly larger; lateral petals (wings) without the tail-like process, spur longer not straight, with clubbed tip.

Impatiens micranthemum,
GERANIACEÆ.
F. B. I. i. 481.
Himalaya, 6-10,000 ft.
Simla (Edgeworth).
Hattu (Collett).
Changlagalli (Douie).

like the last species, but the winged leaf-stalks are prolonged down the stem, flowers white with red and yellow spots, much smaller, ¼ in. long, spur also ¼ in., straight.

Impatiens brachycentra,
GERANIACEÆ.
F. B. I. i. 481.
Himalaya, 8-12,000 ft.
Murree (Fleming).

medium-size, stem not winged, slender, smooth, branched; leaves 2-5 in., ovate-lanceolate, round-toothed, teeth tipped with a glandular bristle, long-stalked, long-pointed; stipular glands often present; flowers ¼ in. long, white in racemes or umbel-like clusters in the axils of upper leaves, lip boat-shaped, spur minute or none, capsule narrow oblong ½ in., nearly cylindric, tapering to a point; otherwise like the rest of this genus.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Psoralea corylifolia, *Babchi.* LEGUMINOSÆ. F. B. I. ii. 103. The Plains.

medium-size, annual, branches dotted with glands, leaves 1-3 in., roundish, with a widely round-toothed margin, firm, coverd with black dots above and below; flowers $\frac{1}{5}$ in., yellow or white, tipped with purple, 10-30 crowded in long-stalked head-like clusters, calyx nearly sessile, bell-shaped, $\frac{1}{8}$ in., teeth 5, lanceolate, the lowest longest, corolla projecting a little beyond the calyx, lower petal keel-shaped blunt, tip slightly incurved, stamens 10, upper stamen united or not with the others in a tube, style long, thread-like, incurved; pod nearly round, small, smooth black.

PETALS UNITED.

Malvastrum tricuspidatum, MALVACEÆ. F. B. I. i. 321. The Plains. Lahore, Delhi, Rawalpindi. (introduced).

medium-size, branched, covered with simple hairs; leaves 2 in., ovate-lanceolate, irregularly toothed, leaf stalk $1\frac{1}{4}$ in., stipules ununited; flowers yellow on axillary or terminal stalks, $\frac{1}{4}$-$\frac{1}{2}$ in. long, bracteoles 3, narrow, calyx bell-shaped, 5-lobed, triangular, short-pointed, petals 5, twisted, overlapping, longer than the sepals, stamens many, united below and to the petals, forming a tube, styles 8-12, stigmas round; fruit of 8-12 dry carpels, one-seeded, separating from the central column, curved with 3 projecting points.

Sida humilis, see Prostrate Herbs, Alternate, Stipulate, Simple.

Sida spinosa, *Gulsakari, jangli-methi,* MALVACEÆ. F. B. I. i. 323. The Plains.

medium-size, perennial, shruby, stems rough with star-shaped hairs, branches usually armed with curved spiny tubercle at the nodes below the leaf-stalks; leaves $\frac{1}{2}$-2 in., very variable, ovate with or without a broad apex, apex blunt or notched, base heart-or wedge-shaped, grey below with star-shaped hairs, leaf-stalks $\frac{1}{2}$ in., stipules awl-shaped; flowers $\frac{1}{2}$ in. diam., white, on solitary or clustered stalks, jointed near the flower, equal to or longer

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

than the leaf-stalks, calyx tubular below, sepals 5, triangular, short-pointed, hairy, petals 5, united below and to the staminal tube, stamens many, united below into a tube; carpels 5, separating from the central column, crowned each by two long erect rough beaks, equal to the calyx, seeds one in each carpel. The roots and leaves are used in Indian medicine.

Sida carpinifolia, *Bariara, kareta,* MALVACEÆ. F. B. I. i. 323. The Plains.

like the last species, but without spiny tubercles, leaves narrower, stipules broader, veined, bristly, flower stalks jointed near the middle, calyx-tube nearly round, petals twice as long as the calyx, yellow, carpels 5-10, wrinkled, beak of two bristles. Good fibre is obtained from the stems, and other parts are used medicinally.

Sida rhombifolia, *Swet-berela, sahadebi,* MALVACEÆ. F. B. I. i. 323. The Plains. Baluchistan (Lace).

like the last species, but larger, leaves squarer with rounded angles, and tapering at the base, flower-stalks longer than the leaf-stalks, stipules longer than the leaf-stalks, carpels 10, beaked with bristles or not, as long as the calyx.

Sida cordifolia, *Kowar, Simak, bariara,* MALVACEÆ. F. B. I. i. 324. The Plains.

medium size, annual or perennial, downy with long hairs; leaves 1-2 in., oblong, heart-shaped, blunt-pointed, round-toothed, stalk equal in length to the blade, stipules linear, shorter than the leaf stalk, soon falling off; flower stalks solitary, upper very short and crowded, flowers small, yellow, carpels beaked with 10 bristles, netted on the sides, bristles longer than the sepals, covered with stiff reflexed hairs; in other respects like the last species. The flowers in this genus only expand at noon.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

Abutilon indicum, *Kanghi, jhampi.* MALVACEÆ. F. B. I. i. 326. The Plains. Delhi. Rawalpindi (Douie).

medium-size, annual or perennial, more or less downy; leaves 1-2 in. long, broadly heart-shaped, short-or long-pointed, coarsely toothed, or nearly entire, pale and minutely velvety on both surfaces, stalk longer than the blade, stipules sharply bent down; flowers 1 in. diam., yellow on axillary solitary stalks, longer than the leaf-stalks and jointed at the top, calyx tubular, 5-lobed, ovate with or without a hard sharp point, petals 5, spreading, stamens as in the genus Sida above; carpels 15-20, longer than the calyx, with short spreading bristle-pointed beaks, felted at first, afterwards nearly smooth, seeds one or more in each carpel, kidney-shaped, dark brown, covered with minute star-shaped hairs.

Abutilon bidentatum, MALVACEÆ. F. B. I. i. 326. The Plains. Baluchistan (Lace).

like the last species, but perennial, leaves $2\frac{1}{2}$-3 by 2 in., heart-shaped ovate, long-pointed, round-toothed, downy above and below, stalks of lower leaves 4-5 in., stipules short, awl-shaped; flower stalks $1\frac{1}{2}$-2 in., calyx-tube cup-shaped, lobes ovate, short-pointed; fruit $\frac{1}{2}$ in. diam., carpels 20, smooth, oblong, twice as long as the calyx.

Urena repanda, see Herbs, Erect, Alternate, Stipulate, Lobed.

Hibisens trionum, see Herbs, Erect, Alternate, Stipulate, Lobed.

Hibiscus solandra, see Herbs, Erect, Alternate, Stipulate, Lobed.

Hibiscus sabdariffa, see Herbs, Erect, Alternate, Stipulate, Lobed.

Hibiscus abelmoschus, see Herbs, Erect, Alternate, Stipulate, Lobed.

biscus cancellatus, see Herbs, Erect, Alternate, Stipulate, Lobed.

Pentapetes phoenicea, see Herbs, Erect, Alternate, Stipulate, Lobed.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS NONE.

Ranunculus hirtellas, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Ranunculus sceleratus, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Ranunculus lætus, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Ranunculus arvensis, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Girardinia heterophylla, see Herbs, Erect, Alternate, Stipulate, Lobed.

ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNUNITED.

Reseda pruinosa, see Herbs, Erect, Alternate, Stipulate, Simple, Entire.

Triumfetta pilosa, *Nichardi,* TILIACEÆ. F. B. I. i. 394. The Plains to 5,000 ft. Simla (Collett). medium-size, perennial, branches covered with soft star-shaped hairs; leaves 3-5 by 1-2 in., ovate, lower leaves 3-lobed, toothed, covered with star-shaped hairs on both sides, stalk $\frac{3}{4}$ in., hairy, stipules awl-shaped, bristly, shorter than the leaf stalk; flowers $\frac{3}{4}$ in., yellow in axillary and leaf-opposed clusters, main flower stalks hairy, shorter than the leaf-stalks, minor flower stalks very short, very hairy, bract awl-shaped, hairy, sepals 5, linear bristle-pointed, petals 5, ovate-oblong, hairy at the base, stamens 10 or so, ununited, style thread-like, 2-5 toothed; fruit $\frac{1}{2}$ in. diam. including the hairy hooked spines $\frac{1}{4}$ in. long, nearly round, 4-celled, seeds 8, round, dark-brown, flattened on one side.

Triumfetta rhomboidea, see Herbs, Erect, Alternate, Stipulate, Simple, Toothed.

Corchorus acutangulus, see Herbs, Erect, Alternate, Stipulate, Simple, Toothed.

Geranium pratense, see Herbs, Erect, Opposite, Stipulate, Lobed.

Geranium collinum, see Herbs, Erect, Opposite, Stipulate, Lobed.

Geranium palustre or grandiflorum, see Herbs, Erect, Opposite, Stipulate, Lobed.

Geranium tuberaria, see Herbs, Erect, Opposite, Stipulate, Lobed.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNUNITED.

Peganum harmala,
Harmal,
ZYGOPHYLLACEÆ.
F. B. I. i. 486.
The Plains to 5,000 ft.
Kashmir.
Baluchistan (Boissier).

medium-size, root perennial, stem and branches annual, bushy, smooth, pale-green, leaves 2-3 in., much divided, lobes or segments linear, short pointed, stipules bristle-like; flowers $\frac{1}{2}$-$\frac{3}{4}$ in. diam., white, solitary, sessile or stalked in the axils of branches, sepals 4-5, linear, short-pointed, persistent, usually longer than the petals, petals 4-5, oblong, nearly equal, soon falling off, stamens 12-15, broad below, some without anthers, styles twisted, 2-3, keeled above; capsule $\frac{1}{5}$-$\frac{1}{3}$ in. diam., depressed above, lobed, splitting into 3 valves, seeds many, angled. A red dye is obtained from the seeds and different parts of the plant are used in native medicine.

Lourea vespertilionis,
LEGUMINOSÆ.
F. B. I. ii. 154.
The Plains.

small, annual, slender, stems finely downy; leaves $\frac{3}{4}$-1 in. long, 2-3 in. broad, divided into two equal lobes, linear, apex of each broadly notched and bristle-tipped, rarely one leaflet on each side making a compound leaf, side leaflets smaller, obliquely triangular with the point inwards; flowers $\frac{1}{4}$-$\frac{3}{4}$ in., in simple or rarely branched racemes, 3-6 in., calyx $\frac{1}{4}$ in., bell-shaped, teeth lanceolate equal to the calyx-tube, petals 5, standard broad, keel blunt, stamens 10, not all united, style thread-like, incurved; pod smooth, veined, joints 4-5, and each one seeded, all included in the enlarged calyx.

Spiræa vestita,
ROSACEÆ.
F. B. I. ii. 323.
Himalaya, 7-12,000 ft.
Kashmir.
Hattu (Collett).

medium size, shrubby, root perennial, stems velvety, very like Meadow Sweet, *Spiræa Ulmaria*; leaves 2-12 in., irregularly divided into lobes, lateral lobes few or many, sharply toothed, small, or one or two pairs $1\frac{1}{2}$ in. long, terminal lobe 2-6 in. diam., deeply cut into three to five sharply toothed, long-pointed segments, upper surface smooth, lower white-felted, stipules half circular, large, sharply toothed, persistent; flowers $\frac{1}{4}$ in. diam., white in large oblong much branched terminal clusters, calyx 4-5-lobed, very small, lobes blunt, persistent, petals 4-5-oblong-rounded, stamens many, styles many, nearly terminal; carpels many, ununited, woolly, 2 seeded.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE PROGRESS OF THE MAMMAL SURVEY.

In the beginning of March, the Society's Collector, Mr. C. A. Crump, was sent to East Kandesh. Arriving at Jalgaon on March 5th, he remained there for five days and did some trapping in the vicinity of the town. Nothing of any special interest was obtained, but a fox was seen which appeared to be larger than the Indian fox (*Vulpes bengalensis*)* and had a white tip to its tail. Apparently this must have been the Desert Fox (*V. leucopus*), a species according to Blanford confined to the drier districts of Sind, Rajputana and the Punjab.

From Jalgaon a move was made S. W. to Parola, where Mr. Crump went into camp with Mr. A. H. Simcox, I.C.S., from whom he received much assistance. The country round Parola, being mostly cultivated with patches of scrub jungle here and there, was not very productive of specimens, and so, after a short stay, a move was made on to Bhadgaon on the G. I. P. Railway line and from there on to Shendurni, arriving at the latter place on March 30th. Round Shendurni there is extensive cultivation of betel leaf (*Piper betle*) in small gardens surrounded by grass "tattis," sometimes about 15 feet high. The gardens are irrigated and make cool retreats for jackals and cats during the day-time. The cats (*Felis chaus*) are very destructive to poultry in these districts and frequently carry off fowls, before it is dark, within sight of the owner. The mungoose does not appear to be common in this part of Kandesh, and hyænas were not met with nor were their tracks observed. Leaving Shendurni a short trip was made across the Kandesh border to Fardapur and from there one day was spent in visiting the Ajanta Caves to obtain bats. Thousands of bats were found to inhabit the caves, but only two species of sheath-tailed bats were obtained, and no young were seen. Both sexes were found in the same cave, but, as a rule, the species were not mixed. The species were *Taphozous melanopogon* and *T. kachhensis* or a species closely allied to it. From Fardapur, camp was moved back into Kandesh at Jamner, but as the country was very similar to that which had already been visited, a move was made to Ghodasgaon, where the country changes considerably. The Girna river separates the forest land from the cultivated, the

* All scientific names mentioned are merely provisional as the specimens have not been worked out at the British Museum.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

former stretching to the range which divides Kandesh and Nimar. The jungle was rather open, but large numbers of Pea-fowl were to be found. The forests being closed, cheetal were to be seen in large numbers, and they were very tame. Many were noticed drinking about 10 a.m. and between 6 and 8 p.m. Sambur, too, are plentiful, and appear to drink much later than cheetal generally between 10 and 12 p.m. Nilgai, which were very common, were noticed drinking at all hours of the night, but more especially between 8 and 10 p.m. Chinkara were seen drinking about midday, and pigs, which were plentiful, appeared to drink just about the darkening. Many porcupines' earths were found, but near Ghodasgaon they had been smoked out by some wandering tribes. It was noted that most of the porcupine earths had four or five entrances, two or three being much larger than the remainder, and that the remains of many chewed sambur and cheetal horns were to be found lying about in the vicinity.

Mole rats being difficult to trap here, though their workings were much in evidence, a large number were obtained by digging out their burrows. A few small rodents, a couple of hyænas, a jackal and some bats were obtained at Ghodasgaon, but no monkeys were seen, and the natives say they do not visit that part of the country till after the rains in September.

A move being made to the railway line, train was taken to Amraoti, and from thence Mr. Crump worked up to Chikalda and down the Sipna valley to the Tapti river returning to the railway again at Malkapur on account of the approach of the monsoon. Chikalda is about 3,600 ft. above sea-level, and is surrounded by heavy jungle in which sambar, muntjac, four-horned antelope, pig, panther and an occasional tiger are to be found. A hare similar in appearance to *Lepus nigricollis* is not uncommon, but no mungooses were seen, and they were reported as unknown so high up. The langur, *Presbytis entellus*, or a rather more brightly coloured race, is very common, but strange to say was difficult to approach. The small Bengal monkeys are said to frequent the fort, but only one was seen, and all endeavours to come across more were of no avail. A number of mice and rats were caught in the ruins of the Fort and a few palm squirrels were seen, but they were not at all common. No flying squirrels or large Indian squirrels were seen and they are said not to be found there. The results of the Chikalda

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

visit are, it must be confessed, disappointing, as it was expected that a hill of some 3600 feet would have yielded a rather different fauna to the surrounding country as is the case with Matheran.

Leaving Chikalda a move was made north to Sembadoh in the Sipna valley. Fine heavy jungle is found round here, and in the river there are some good pools. Flying squirrels were fairly plentiful, but on only one occasion were they seen before dark. As they sail through the air, they make a sort of swishing sound which ends as they alight on a tree stem with a noise described as similar to that produced by swinging a piece of sacking against a wall. While following the tracks of a wounded bear three wild dogs, two adults and one puppy, were seen and two were obtained. A few rats and mice were caught and several muntjac and four-horned antelope were shot.

The total number of skins obtained in Kandesh and the Berars was about 150, besides one or two birds and a few invertebrates.

Since the last Journal was published, a further sum of Rs. 10,032 has been subscribed, making the total now some Rs. 20,816. This is not yet however enough to carry out the survey as proposed, and we hope members who have not already subscribed will see their way to do so. The Military Secretary to H. E. the Viceroy has written and informed the Honorary Secretaries that His Excellency "thoroughly approves of the scheme the Bombay Natural History Society is attempting to carry out, and hopes that the results will be successful;" and many people at home, including H. R. H. the Duke of Connaught, have shown their interest in the scheme by sending subscriptions. It has been decided to bring out a second collector, as to cover all India, Burma and Ceylon would take one collector a very long time. The services of Mr. Shortridge have been secured, and he is expected out here shortly, and he will at once start to work Southern India starting at Dharwar. In Mr. Shortridge, the Society have secured a higly trained collector with plenty of experience of tropical and subtropical countries. Mr. Shortridge only a short time ago returned from the British Ornithologists Union Expedition to New Guinea, and before that had done extensive collecting for the British Museum in Java and Northern Australia, through the generosity of Mr. Balston.

2nd September 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MAMMAL FUND.

LIST OF SUBSCRIBERS.

Name.	Amount.		
	Rs.	A.	P.
Amount previously acknowledged	10,908	15	0
Anderson, Mrs. J.	200	0	0
Andrews, G. P.	15	0	0
Ash, H. D.	30	0	0
Baroda, H. H. Sayajirao, Gaikwad of	500	0	0
Battie, J. S.	10	0	0
Beadon, W. R. C.	10	0	0
Beg, Mirza Nazir	10	0	0
Bell, E. N.	15	0	0
Bennett, H. C.	15	0	0
Blathwayt, C. H.	30	0	0
Boyd, Capt. J. E.	15	0	0
Bridgeman, Hon. Mr. H. G. O.	25	0	0
Briscoe, W. F.	15	0	0
Burton, Major R. W.	15	0	0
Carmichael, G.	30	0	0
Carter, Major J. B.	25	0	0
Chico, J. R.	25	0	0
Chitty, the Hon. Mr. Justice C. W.	30	0	0
Congreve, C. R. T.	20	0	0
Cosens, Lt. G. P.	50	0	0
Cox, Lt.-Col. P. Z.	100	0	0
Cruickshank, W. D.	20	0	0
Dhar, H. H. the Raja of	500	0	0
Donald, C. H.	50	0	0
Dumayne, Sir F. G.	10	0	0
Dunbar-Brander, A. A.	10	0	0
Dunn, C. W.	15	0	0
Ellis, E. V.	30	0	0
Enthoven, R. E.	20	0	0
Fenton, Lt.-Col. L. L.	25	0	0
Fletcher, T. Bainbrigge	10	0	0
Gallie, H. H.	25	0	0
Gaye, W. C.	10	0	0
Gibbon, M. C.	20	0	0
Gore, F. W.	5	0	0
Gough, Major H.	25	0	0
Gregson, Capt. C. D.	30	0	0
Harter, R. W.	30	0	0
Harvey, Major W. F.	30	0	0
Hawley, Capt. W. G. B.	15	0	0
Hayden, H. H.	20	0	0
Howell, E. B.	15	0	0
Carried over ..	13,008	15	0

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Name.	Amount.		
	Rs.	A.	P.
Brought forward ..	13,008	15	0
Hudson, C.	15	0	0
Hyam, Judah	10	0	0
Hyderabad, H. H. the Nizam of	2,500	0	0
Idar, H. H. the Maharaja of	200	0	0
Inman, Capt. H. M...	15	0	0
Inverarity, J. D.	100	0	0
Ivens, J. H. A.	10	0	0
Jacob, W. R. M.	10	0	0
Jardine, W. E.	50	0	0
Jeddere-Fisher, H. C.	50	0	0
Julius, V. A.	20	0	0
Kemball, H. V.	100	0	0
Kerr, Dr. A. F. G.	20	0	0
Kerr, Nigel	10	0	0
Kotawalla, Seth Keshrising	100	0	0
Kurundwad, Chief of (Senior)	75	0	0
Lace, J. H.	25	0	0
Lamington, Lord	15	0	0
Lloyd, Capt. R. E.	20	0	0
Logan, R. O.	20	0	0
Long, G. R.	25	0	0
Lowsley, C. O.	10	0	0
Luard, Major C. E.	50	0	0
Macrae, Major J. L.	10	0	0
Macwatt, Lt.-Col. R. C.	15	0	0
Macwood, F. M.	100	0	0
Martindelle, H. E.	20	0	0
Maxwell, R. M.	25	0	0
Mead, P. J.	25	0	0
Mears, Major A.	10	0	0
Mess President, 122nd Infantry, Quetta ..	30	0	0
McDiarmid, K.	10	0	0
Millett, G. P.	20	0	0
Milward, R. C.	100	0	0
Mitchell, H. H. G.	50	0	0
Moule, Capt. H. E.	25	0	0
Mullen, J. P.	10	0	0
Newnham, Lt.-Col. A.	25	0	0
Northcote, Lord	150	0	0
Ormiston, W.	20	0	0
Peters, Lt.-Col. C. T.	15	0	0
Pollard, Capt. A. E. St.V.	30	0	0
Pope, J. A.	20	0	0
Purkis, F. C.	10	0	0
Reay, Lord	100	0	0
Rogers, C. G.	25	0	0
Carried over ..	17,303	15	0

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Name.			Amount.		
			Rs.	A.	P.
Brought forward ..			17,303	15	0
Saunders, Major F. W.			15	0	0
Sedgwick, L. J.			10	0	0
Sharp, Hon. Mr. W. H.			20	0	0
Shipp, W. E.			10	0	0
Simonds, Capt. M. H.			15	0	0
Simpson, J. Hope			32	0	0
Sinclair, R. L.			25	0	0
Skinner, R. R.			10	0	0
Smales, C. B.			25	0	0
Spence, R. A.			20	0	0
Stephens, L. B.			25	0	0
Sulivan, Col. G. D. F.			30	0	0
Suter, Dr. M. F.			40	0	0
Symes, W. C.			15	0	0
Tata, R. J.			1,000	0	0
Tenison, W. P.			15	0	0
Tomkins, Major E.			20	0	0
Troup, R. S.			10	0	0
Tweedie, A. G.			25	0	0
Tytler, Lt.-Col. H. C.			15	0	0
Wall, Major F.			10	0	0
Wilson, Lt.-Col. C. H. L. F.			25	0	0
Willock, Commander A. R. G.			15	0	0
Worgan, Capt. R. B.			10	0	0
(Foreign Remittances.)					
	£	s.			
Bailward, Col. A. C.	2	0			
Beddome, Mrs.	1	1			
British Museum Natural History.	100	0			
Connaught, H. R. H. the Duke of.	3	0			
Cook, Charles	5	0			
David, Charles	3	3			
Gladstone, H. S.	1	0			
Poncins, Baron Edmund de ..	2	0			
P. Spicer & Sons	1	1			
Pym, Francis	6	13			
Stables, Major Alex	2	2			
Turner, Rowland E.	2	0			
Tweedy, Sir John	5	0			
Ward, Rowland	5	0			
Total ..	139	0 = Rs.	2,075	3	0
Total ..			20,816	2	0

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MISCELLANEOUS NOTES.

No. I.—TIGER CALLING LIKE A SAMBUR.

Mr. Seton-Karr's interesting account of hearing a sambur 'belling' in close proximity of tigers is very like an experience of mine.

Once at Kamaing in the Myitkyina District, I got kubbar late in the afternoon that some tigers, said to be a tigress and cubs, had got into a herd of cattle and had killed and mauled a lot of them. I immediately went out and found that four or five had been killed. I had the carcases dragged near the only tree, which was unfortunately a bare dead one, and had a machan built and spent the night in it. Soon after dark I heard the tigers moving round in the half burnt elephant grass, but they would not come to the " kill ". After a time I heard one calling to my right in the direction of the village, shortly after that I heard a sharp "Sambur-like" call to my right and slightly behind me ; I heard this call at least three times. A little later I heard an unfortunate cow cry out ; I heard it killed and the tigers feeding, (this kill was within 100 yards of my tree). This cow must have been mauled in the afternoon and left behind when the others were driven in. Now this " Sambur-like call " may of course have been a sambur, but the spot was near a village and must have been very disturbed in the afternoon, and so would have been a most unlikely place for a sambur.

In Burma it is a well known fact that tigers often call like a sambur, this is called by the Burmese " Tit " ing. The above is not the only time I have heard this calling ; on two or three other occasions I have heard exactly the same call and been informed by the shikaries that it was a tiger.

I know several other men in Burma who have also heard the same call. In Mr. Seton-Karr's account he does not say he actually saw the sambur, so most probably the call he heard was one of the tigers calling to the other.

H. H. HARINGTON, MAJOR.

MANDALAY, 14th *June* 1911.

In the Miscellaneous Notes of the last issue of your Journal there is included an account of the behaviour of a sambur (*Cervus unicolor*) in the presence of tigers near a kill.

Mr. Seton-Karr does not say that he actually saw the sambur hind but he states that he heard " the sharp clarion call of a sambur hind " and ends his note with a query " why did the tigers not molest her ?" I think the probable answer is that there was no sambur hind to be molested and that what the writer thought was a sambur hind was in reality one of the two tigers which he ultimately saw.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A tiger frequently makes a noise similar to but slightly higher in tone than that of a sambur. When I first heard this noise and was told by local jungle people that it was a tiger, I did not believe it, but have since had proof that a tiger does make such a noise. On one occasion I actually saw a tigress when making a noise which I at first thought to come from a sambur.

The two calls are so similar that even local jungle people cannot always say whether it is a sambur or a tiger calling, and it is easy to understand that even so experienced a shikari as Mr. Seton-Karr might be taken in.

JAMES W. BEST, I.F.S.

CAMP BILASPUR, C. P.
29th *May* 1911.

No. II.—YOUNG TIGER ATTACKING HUMAN BEINGS.

At 11-30 P.M. one night in the middle of February some villagers came and said a tiger had killed a man and woman in their house and was still in the house and asked me to come and kill it. I thought the story was rather queer and, although it was about 5 miles away, I decided to go.

When I got there I found an old woman and a man about 40 years of age had been badly mauled but were not dead. The door of the hut in which the tiger was said to be was nearly closed and a big fire lit in front of it. The hut consisted of four stone walls of about 4 feet and a kutcha grass roof.

I walked round the three walls but could hear nothing and thought it was a fairy tale that the tiger was inside. On asking what size the tiger was "oh bahut bahut burra walla" I was informed. Approaching carefully towards the door I was greeted by a growl from inside which sounded as if it came from a large animal. I got a hole made in the roof, big enough to let my lantern down and then made another low down in the wall.

After looking for a long time I saw the tiger crouched very close to the ground behind a basket. He appeared big and I let him have 8 bullets. He never uttered a sound after the first shot, but his position was not altered, so I did not know whether he was shamming and therefore let him have the others. I was rather sick to find when he was brought out that he was only a cub measuring six feet, but it was a lesson as it only shows what a cub can do. The animal had followed the goats into the house and had attacked the man and woman, but they scrambled through the door which closed after them. They are in hospital here, and are in rather a bad state, the man has a broken arm and a number of wounds and the old woman is covered with wounds, and it will be touch and go whether she will pull through.

MUKTESAR, 26th *February* 1911. H. E. CROSS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. III.—PANTHER AND WILD BOAR.

A rather curious incident occurred to me the other day in a jungle in this district. I was sitting up over a goat, having seen signs of two panthers (*F. pardus*) in the vicinity.

At about 1 A.M. a panther killed the goat, but the moon had set and it was too dark to see it, though the black body of the goat was faintly visible.

Whilst the panther was eating the goat, another animal walked up to the kill and stood about a yard or two from it looking on. The sound of tearing and crunching did not stop for an instant, and I came to the conclusion that this must be the other panther whose tracks I had seen.

After a minute or two this animal came towards the foot of my tree and it was discernible against the whitish grass, I took a shot and brought it down. It turned out to be a big boar (*Sus indicus*).

It was apparently in no way disconcerted by the operations of the panther upon the goat, and the panther cared so little for the presence of the boar that he never even paused in his meal whilst it walked up to within two yards.

F. FITZ-GIBBON, LIEUT.

JUBBULPORE, 22nd *April*, 1911.

No. IV.—GOLDEN CAT, *FELIS TEMMINCKI*, KILLING BUFFALO CALF.

Through the kindness of Mr. T. Rennie, of the Civil Veterinary Department, the Society has received a skin of a Golden Cat killed in Tennasserim. In forwarding the skin Mr. Rennie writes that it was sent to him by Mr. G. P. Andrew, I. C. S., Deputy Commissioner of Mergui, and quotes an extract from his letter. As very little is known of the habits of this cat it is worthwhile putting on record Mr. Andrew's remarks which are as follows:—

" The skin of an animal which was speared near Victoria Point by some Malays after it had killed a buffalo calf. I am quite unable to identify the animal, the Burmans, who in such matters are uncritical, call the animal a " Cha-Ni " the Malay word is " Ri-mao bang sa marah " the Siamese word is " Hau pan deng ". But I gather that all these expressions simply mean a tiger (or panther) of a reddish or tawny colour ".

BOMBAY. N. B. KINNEAR.

No. V.—MUNGOOSES IN THE EASTERN GHATS.

Whilst camping this month on Horselykonda, I saw specimens of *Herpestes auropunctatus*, *Herpestes smithi*, and *Herpestes vitticollis*. Horselykonda is a small peak in the Eastern Ghauts which runs up to 4,000 feet in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

height and is situated on the borders of Mysore in the Madanapalle taluk of the new Chittoor District of the Madras Presidency. The peak is well forested and there was nothing peculiar in finding the Ruddy Mungoose (*H. smithi*) there as it has a very wide range in the Peninsular. The specimen I saw was a peculiarly fine one. It is however not a little remarkable that the small Indian Mungoose (*H. auropunctatus*) should occur there as according to Blanford it is only found in Northern India, not further South, in the Eastern portion than Midnapur. I saw it in the verandah of the bungalow in which I was residing running along the bottom of a palmyra bressumer. It seemed quite accustomed to this inverted position about which, perhaps, there is nothing remarkable in a member of the mongoose family, but which immediately rivetted my attention. It stopped just in front of the door of the room I was in and gave me an excellent view. It was altogether unmistakable and I am quite satisfied as to the species, but I regret to say I was unable to secure it. I saw the striped neck Mongoose (*H. vitticollis*) during a morning walk in the jungle and did not happen to have a gun in my hand at the time. I happen to know the species having seen it before on the Western Ghats.

I am aware that this evidence will be found insufficient to be acceptable to the Society without the accompaniment of skulls and skins, but it struck me that were the matter brought to the notice of readers of the Journal it might induce some few to make closer observations. I think it very likely that the small mungoose may be found on the hills of the Ganjam, Vizagapatam and Salem Districts as well as in Mysore, whereas the striped neck mongoose may be found in Mysore and Salem, and I would suggest these as fields for closer observation.

BELLARY, 27*th May* 1911. P. ROSCOE ALLEN.

[We have certainly never heard of *H. auropunctatus* so far south before. These notes of Mr. Roscoe Allen's emphasize the great necessity for the Survey of Mammals which the Society has undertaken—EDS.]

No. VI.—DISTRIBUTION OF THE SLOTH-BEAR (*MELURSUS URSINUS*), AND THE INDIAN LION (*FELIS LEO*).

In reference to the note by Col. Fenton in Vol. XX, No. 1, at page 213, of the Society's Journal, it is perhaps worth recording that there are at present no bears in Kutch, nor have I heard of any having ever existed here before.

As to the Gir Country being suitable for bears, I was told by Hebat, the Junagadh Shikari, who must be well known to all sportsmen who have shot in that State, that a couple of bears were some time ago let loose in the Gir forest, but that they did not long survive, having died from the effects of swallowing certain wild fruits.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

As to lions, they probably did occur in Kutch, not very long—about 80 or 85 years ago. It has been stated in some books on Sport and Natural History that they were found in Kutch and there are different spots in the Province known by such names as "Lion's Hill," "Lion's Cave," etc. Also some of the old inhabitants assert that they have heard of instances, though rare, of lions having been met with in former times. I questioned an old Rajput, whom I saw in the districts and who had been keen on shikar in the days of his youth, if he had seen a Lion. This man replied that he never saw one himself but that he had known people who had. So, on the whole, there appears to be sufficient evidence to conclude that lions did occur in Kutch at one time, as they did in Gujarat and in other parts of Kathiawar, besides the Gir. In Kutch the common term "Sinh" is used for both the lion as well as the tiger, but it is more probable that the animals which, there is reason to believe, existed in Kutch were lions than that they were tigers.

R. K.

BHUJ, 10*th March* 1911.

P. S.—After I sent my note, dated the 10th March last, my attention has been drawn by Mr. J. H. Smith to the following note in a book (Memoir on the Geology of Kutch).

"Lieutenant Dodd says that Burns, writing in or about the year 1830, mentioned lions, bears, tigers and wolves as to be found north of Bhooj. none except the latter being now visible ; but that a solitary lion was shot on the Runn near Bela, supposed to have wandered from Kattiwar."

R. K.

BHUJ, 17*th July* 1911.

No. VII.—THE BIRTH OF A WILD ELEPHANT CALF.

On Christmas day 1910 my camp was at Kyoukpazat on the Phatashin stream in the Henzada District. Mr. E. V. Ellis, Deputy Conservator of Forests, had come over to spend the Christmas holidays with us and to do a little shooting. During the early hours of the morning we heard wild elephants trumpeting and making a great noise up the Phatashin stream and not more than a mile or so from camp, and when we started the first beat of the morning the elephants were in a little valley just below the spur on which the guns were posted. The beat proved a blank, for nothing came out, and although the beaters made a fiendish noise the elephants did not make off. The next beat was on the next spur and again the elephants were just behind us. This beat was also a blank. Whilst the beat was coming along I noticed that the beaters seemed very excited and kept on saying to one another "let's catch it after the beat." So

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

when they got up to us, I asked what the excitement was about. They then told me that an elephant had given birth to a calf in the stream and they wanted to catch the calf, presumably to kill and eat. But as a young calf was caught and brought to me the year before from a place not four miles from this place, presumably of this very head, and as I had a deal of bother over it, not being able to get sufficient milk to feed it on although I had bought two cows to supply it with milk, I did not feel like being saddled with another calf, so told the men that they were not to catch it. I then told them to take us to the place where the birth took place. This was in the bed of the Phatashin stream close by, and we soon got to the spot. The elephant had selected a soft spot in the bed of the stream and close to the water and dropped her calf there. The ground was a bit cut up and the Burmans went poking about and soon unearthed a small bag full of water. After this they crossed the stream which was only a couple of yards wide (the water part) and dug about in another place where the ground was turned up, and soon produced another bag, the "after-birth" (achin) which was buried about a foot deep in the sand and pebbles. The Burmans were highly delighted at the find, so I naturally asked them what they were going to do with it, to which they replied "why, eat it of course." They soon had the "after-birth" washed and tied up in their sheets and were ready to go home and start cooking it, but we were not done with the beating, so went on and had two or three more beats in which we got a barking deer and a great big wild boar which they said had killed a man on the very spur we got it on not two months before. The man who was killed had followed up the boar from the paddy fields and had wounded it with an arrow shot from a cross-bow and on following it up, the boar charged him. He tried to climb a tree but the boar was too quick for him and ripped him badly and he died of the wounds after a few days.

Talking of the parturition of elephants, Lieut.-Colonel G. H. Evans, Superintendent of the Civil Veterinary Department of Burma, in his Treatise on Elephants, *Elephants and their Diseases*, notes on page 96 that an elephant gave birth to a calf at Pazundaung near Rangoon and that the Burman attendant stated that the dam ate the "after-birth." I wonder if this happens only in the domesticated state or whether wild elephants eat it too. In the case noted by me the dam certainly did not eat the "after-birth" for we found it intact. I have often noticed that domesticated goats, cows, buffaloes and sheep eat the "after-birth." I would be glad if some one would explain the reason of this to me. Does the dam eat it to clear herself?

C. W. ALLAN,
Divisional Forest Officer.

HENZADA, BURMA, 26*th March* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. VIII.—NOTES ON THE GAUR (*BOS GAURUS*).

In September 1905 Mr. Aylmer Martin delivered a lecture before the members of the High Range Natural History Society on the Gaur (*Bos gaurus*). Mr. Martin has kindly forwarded the MS. of this lecture to us and has allowed us to make extracts from it.

Writing of the colour of the head and body Mr. Martin says:—

"As regards colour, the hair on the forehead and frontal ridge of a specimen we had alive under almost daily observation at Sothapara for 4½ months was slaty grey, black down the front and sides of the face; the muzzle large and dark slately grey in colour. The greatest spread of the horns of this specimen was 34½ inches.

There are many different shades of colour in a bison's horns, at the base a dull slate, giving way, a little further up, to a yellowish tint, which again turns into a dull greenish colour, getting darker towards the tips, which are always quite black. The ears are larger in proportion to the head than those of domestic oxen, and black outside, the rich yellow skin of the inside showing through ridges of black hair. The eye has been much discussed and has mostly been described from dead beasts. The Sothapara specimen we were careful to make note of, the iris of his eye was a mottled light brown, and pupils a slaty blue.

He stood 16 hands 1½ inches at the shoulder. His body colour slatey grey on the dorsal ridge deepening through shades of brown to intense black on the sides and shoulders, coffee-brown on the hind quarters, turning gradually to black on the flanks. The hoofs were white, and the legs white from 2 inches above the knees and hocks *outside* and from 1 inch above the knees and hocks on the *inside* of his legs.

The hair inside the thighs and armpits was a bright chesnut. The neck was black and had a large dewlap hanging down to a little below the level of his knees. I give this description from notes I took from the live mature animal at the time, and having since examined several bison shot by myself and others I find that it is accurate enough to pass for them all. Nevertheless, it contradicts in important particulars the description given by many well known authorities."

In regard to the presence and absence of dewlap, colour of eye, &c., about which there has from time to time been much discussion, Mr. Martin writes:—

"Sanderson wrote in 1879 his 'Thirteen years among the Wild Beasts of India,' a charming work full of truth and beauty; he is silent on the dewlap question, but differs from my description in other respects. Mr. Edward Kindersley, who has shot bison on these hills and elsewhere, wrote in November 1893 to the *Nilgiri News*—'*I have never to my knowledge shot a dewlapped bison*,' while Mr. A. W. Turner, whose knowledge

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of game on these hills has never been approached, much less equalled, told me that all bison had dewlaps. These diametrically opposed observations led me to suspect that there might be two varieties of the animal, one with and the other without dewlaps, and this idea was strongly confirmed, when I found to my surprise that the Muduvars on these hills recognised both varieties and had a different name for each, one meaning 'Cow Cattle' and the other 'Buffalo Cattle.' They even speak of herds living apart and occupying different parts of the country. Still, the difficulties in the way of accepting finally, and as a fact, that two different varieties exist in such close proximity without intermixing, are so great that I cannot say that my mind is made up on the subject. I must give you just a couple more references. Long after the question was mooted Mr. C. E. M. Russell wrote a book in 1910, called 'Bullet and Shot,' in which he says:—'*Although, as a rule, a Bison has no dewlap, the first bull I ever bagged had a well-defined one. Capt. (now Col.) W. (late of the 43rd O. L. I.) who was with me, and who had shot a very large number of Bison was greatly struck by the dewlap carried by this animal, a solitary bull with a very fair head, and he called my attention to it.*'

Mr. Stuart Baker, in an article well worth study, which he contributed to the Journal of the Bombay Natural History Society, Vol. XV, No. 2, says on page 236, that he considers the dewlap merely an individual characteristic, and while this may be true, it will be curious if we find that other characteristics always accompany the dewlap, such as, for instance, the shape of the horns, and the ram-nosed profile of the face.

I have dwelt a long time on the subject of the dewlap, because it is not yet a settled question, and the accepted authorities have still to be put right in the matter. More particularly it should be noted if dewlapped bison are ram-nosed, and those without dewlaps straight-nosed, and if there is any difference in the shape of the horns, or in the breadth of the skull. Bison should be carefully observed with the telescope, and when possible with the unassisted eye, before stalking or shooting them, because the way a beast falls makes it sometimes difficult to see whether the dewlap is present or not.

Another much disputed point is the colour of the eye, query, does it vary? And the 'white stocking' has been incorrectly observed by Sanderson and others. Sanderson indeed makes two mistakes in one sentence, he writes 'the legs *below* the knee downwards, as also the forehead, are of a dirty white colour,' and the beautiful illustrations in his book bear out these wrong descriptions; the white stocking commences from above the knees as I have already told you, and the forehead is not of the same colour at all. As regards the size of heads, which will interest sportsmen more than others, I will not say much because I have

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

written all I know on the subject to Mr. Koechlin, and perhaps it will appear in connection with the game register he is keeping.

The measurements of the largest pair of horns of *Gavaeus gaurus* in the possession of the Bombay Natural History Society is given in Vol. XV No. 4, page 706.

Since preparing this paper I find that Col. Pollock wrote in the 'Zoologist' an article in which I see that he did me the honour to quote me extensively on the Gaur, his whole article is copied into Vol. XII, No. 1 of the Journal of the Bombay Natural History Society, where some startling measurements of the Burmese Gaur as compared with the Indian are given on page 193."

In the jungle close to where Mr. Martin lived for several years a herd of about 40 Gaur made their head-quarters and so he had ample opportunity of observing their habits, which he writes of as follows :—

"As regards habits, I can only give you my own observations, which are limited to the High Range, and do not extend even to the Cardamom Hills or ghauts. You will find that their habits become modified in the Mysore Bamboo jungles described by Sanderson, and for the Central Provinces Sterndale gives descriptions. The specimen-hunting American, Hornaday, describes what he observed on the Anamallays.

For several years when I lived in the Old Sothapara Bungalow, a herd of about 40 lived in the jungle opposite, in what is now Gundumallay Estate. They were very seldom disturbed, and their habits were very regular ; they used to appear in the evening any time after 3 p.m. and graze up the grass hills out of sight and return between 6 and 7 a.m. in the morning. But much depended on the weather ; for, sometimes they would remain out much later, and on some occasions I have known them not to return to the jungle for several days at a time. They fed mostly on the short grass to be found at 7,000 to 8,000 ft. above the sea, and also on the course grasses to be found at the edges of the jungle. Inside the jungle they browsed on "Kurunja" (*Stobilanthes*) and bit off the heads of saplings of many sorts, but more, I think, in idleness than for the sake of food. The Mauritius and Guinea grass I had at Sothapara was a great attraction to those individuals who had once tasted it. Sometimes the bulls were with the herd and sometimes not ; calves of all ages there always seemed to be, the young ones being red in colour. The older bulls seemed to wander further a field than the herd did, but they always were within a few miles. Major Rodon got a fine 37 inches head which he called 'Solitary,' and of course it was quite by itself when he shot it, but there was only the 'Gundu' of Gundumallay between it and the herd. Mr. Tollemache got a very nice no-dewlapped bull, with a detachment of the herd which had separated from the main body as they sometimes did. Mr. W. D. Martin got a 38 incher up in Benson's Valley, quite by itself, at a time when we did not.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

know quite where the herd was. I got a couple of smaller bulls belonging to the same herd, when they were quite away from it. Much has been written and said about the 'Solitary Bull' and some people think that, any bull found by itself deserves this title. My own impression is that most of these solitary bulls are really members of a herd within a few miles, and one is quite certain to meet them with the herd at certain seasons of the year. What I understand by the Solitary Bull, is the aged and morose old beast (with horns worn to a stump perhaps), that either will not or cannot or is not permitted to join the herd. I have known only one such and he was lame from a damaged hoof, and was shot by a French Planter called DeFondclair, near Harehatch. There is always one bull who not only thinks himself to be lord of the herd, but the herd recognizes him as such and in certain circumstances he rushes up, to see the cause of any mysterious alarm.

When I first came to the country I accompanied a friend one evening to have a look for tracks, and we blundered into a small herd of bison in some "Cheppukad" at the foot of the Shola opposite the Kundale Bungalow, (there was no such bungalow of course in those days) and we both ducked down and hid as best as we could, on hearing the stampede around us; in a short time we became aware of a crashing sound and a snorting beast approaching us, and my friend L. stood up and shot at close quarters what turned out to be the bull of the herd.

The other time was even more exciting, for my wife and I were out after ibex, and found a herd of bison on the grass ridge, which led up to the ibex grounds on the Kundale Range. The direction of the wind favouring us, we found an excellent observation place in a cleft between two rocks, in which grew a small rhododendron tree; by using both the rocks and the tree, we were able to shin up the cleft one at a time and get our heads more or less on a level with the ground on which the bison were lying, composedly chewing the cud, about 50 yards off. We never knew exactly why, but we noticed that one by one the bison stood up and took up a more or less crescent shape formation facing us. I suppose our heads slowly appearing and disappearing seemed very suspicious circumstance to them, for after a good gaze in our direction the bull advanced with loud snorts, pawing up the ground, and tossing up tussocks of grass with his horns. He actually gave a loud challenge—a prolonged and alarming 'moo'—quite unlike the grunt of the domestic bull of this country. I had no thought of firing at him, for I was armed with a ·450 Express, and only had with me soft hollow-fronted bullets quite unsuited to meet the frontal attack this beast made on our position. I should have told you that another rhododendron was growing with its roots on level with the top of the rocks, in the cleft between which we were by this time hiding. We heard the beast 'go for' the lower branches of this tree and smash them

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

up with his horns, after which, with loud snorts he came round to one side, and as it seemed to me he would soon descend to the same level as ourselves, and have us at his mercy. I stepped out and faced him at 5 paces, and as he was not quick enough in making up his mind to go, I fired both barrels into his dewlap, and to my relief he turned and bolted with the whole herd. We found no blood at all, and I do not know where my bullets could have lodged. I have no doubt these bison imagined they were being watched by a leopard or a tiger, and not by human beings.

Bison ascended to the highest plateaux, 8,000 ft. above the sea and over on these hills, and live on them if undisturbed for prolonged periods. In spite of their shyness and apparent timidity I am quite sure they are capable of being domesticated at any rate to the same extent as the 'Gayal' of Northern India. Some individuals are, no doubt, more docile than others, as is the case with every cow and every bandy bullock. I have known bison to feed and drink at all times of the day and night.

About their calls, they make several sounds; a long drawn out 'Moo' rather like the English short horn, or a low 'Moo' seemingly enquiring as to the proximity of its neighbours, a rough snort when dashing off in alarm and several repeated short snorts when challenging, say, a carnivorous or supposed carnivorous enemy.

I have known wounded bison to charge, and in one case a Muduvar nearly stepped on a bull in the Vuttavadi Valley in long grass, and was gored in the stomach—marvellous to relate he recovered from the horrible wound.

I do not credit tales of quite unprovoked assault on the part of the Bison in spite of the above case, where, no doubt, the poor brute was quite as alarmed as his victim; it was the result of sudden fright, and not malice of which I believe this great and noble animal to be incapable."

No. IX.—THE DOMESTIC BREEDS OF INDIAN SHEEP.

Prof. Cossar Ewart, F.R.S., of Edinburgh and myself are engaged in an investigation as to the origin of some of the domestic breeds of sheep, a subject which has been greatly neglected by modern Zoologists, who mostly ignore the domestic races. I should be very much obliged if any members of the Society could supply us with (1) good photographs taken from living animals of the pure races of Indian sheep, (2) skulls with horns as large as possible of typical adult rams, (3) a sample of the skin showing the wool or hair when fully grown. As there has, no doubt, been a great deal of inter-breeding some local knowledge is necessary in selecting the specimens. So far as I know at present there are in India the following distinct species:—(1) the Hunia breed of Nepal with its unicorn variety, which I believe has been segregated and breeds a proportion at least of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

unicorn rams; (2) the big coarse-haired Ladak race commonly used for carrying burdens; (3) the very coarse-woolled or hairy brown-breed of Southern India, often kept for fighting purposes; (4) various races of fat-tailed sheep originating in the Persian Gulf, probably much degenerated in India; (5) the black and white Aden breed, and (6) the fine-woolled Afghan breed of which I know absolutely nothing, except its skin in the form of a *poshteen*.

I shall be glad to pay any reasonable expenses entailed in this inquiry, if any one who is interested will communicate with me. Our difficulties are increased by the fact that no live sheep can be imported to England now, except through the Zoological Gardens, and that the Oriental races seldom live long in this country.

H. J. ELWES.

COLESBORN, *22nd April* 1911.

[We hope members will help Professor Cossar Ewart and Mr. Elwes in this inquiry, and we shall be happy to forward any skins or heads for members to England.—EDS.]

No. X.—WEIGHT AND MEASUREMENTS OF A SEROW.

At the invitation of a friend, I was out shooting the other day on a tea garden some two miles below the station of Kurseong. We first beat a precipitous hillside (elevation about] 1,800′) covered with light bamboo and scrub jungle. The luck was all on my friend's side, the result of two barrels and a third to "mak sicca" being a Barking deer (*Cervulus muntjac*) and a Serow (*Nemorhædus bubalinus*), the measurements of the latter, taken by myself personally, were as follows:—

Length, tip of muzzle to root of tail ..	5′-4″
Do. do. including tail ..	5′-7″
Height at withers	3′
Girth behind shoulder	3′-3″
Length of horns	7⅛″
Weight	260 lbs.

The above was a female and seemed in first class condition. The flesh which we tasted we thought somewhat resembled beef.

Lower down in the Balasar valley we were lucky enough to secure a woodcock, and flushed a second, which however was far too wary a bird to leave the bamboo jungle, though the beaters did their best to make him show himself. A Kalij and some other birds ended a most enjoyable little shoot.

ALEX. M. PRIMROSE.

LONGVIEW, T. E., PUNKABARI P. O.,
16th March 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XI.—WEIGHT AND MEASUREMENTS OF A GORAL.

My collector yesterday, when out after birds at an elevation of about 3,500′ came across a Goral *(Cemas goral)* (which I take to be a young male) which he secured. The measurements read as follows:—

Total length (between legs) muzzle to root of the tail	41½″
Tail without hair	6″
Tail, including hair	10½″
Height at withers	26½″
Girth at shoulder	28″
Ear from base at tip	6″
Horn, right	6 1/16″
Do. left	6″
Weight	56 lbs.

A. M. PRIMROSE.

LONGVIEW, T. E.,
PUNKABARI P. O., *4th August* 1911.

No. XII.—STRANGE MORTALITY AMONGST BLACK BUCK (*ANTILOPE CERVICAPRA*).

In Vol. XVIII, Part 2, pages 493-4, some notes appeared under the heading "Do wild animals die a natural death." In these notes attention was drawn to the fact that, in spite of the numerous herds of buck abounding in certain localities, sportsmen rarely, if ever, found a buck dead, which appeared to have succumbed to natural causes, nor do they, I believe, meet with natives who admit having found animals dead without being able to assign a cause. The following facts may not be without interest. In December last Colonel Farmer and I were out on some work on the Farm at Hissar in the Punjab. On our way home one of our Camel Sowars noticed a buck lying stretched out in an open place. On going to the spot we found a very fine buck lying quite in the open and evidently not long dead. We examined the carcase carefully and so did the men but we failed to find any wound or injury. There was a greenish watery discharge from the mouth and nostrils. The animal was in splendid condition. We hoisted the buck on a camel, brought it in and made a *post-mortem*. The lesions, we observed, were those of gastro-enteritis, as if the result of some irritant poison. The Bir Chuprassis were warned to keep a sharp look-out in case there was disease prevalent; some two days after a doe and fawn were found dead and brought in, we made *post-mortems* on these animals and the appearances presented were exactly the same as those seen in the buck. We did not hear of any other deaths, and there were no cases of sickness or death among the stock grazing over the country. It is strange that these animals should have presented similar

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

post-mortem lesions ; other animals may have succumbed, but we did not hear of any. There is no question that once vultures become aware of the presence of carrion, it does not take long for them to dispose of it. We saw them dispose of the carcase of a fine donkey, in, so to speak, the twinkling of an eye. The number of vultures which fed on the carcase of this donkey would have consumed a buck in about seven minutes.

G. H. EVANS,
Lieut.-Colonel.

LAHORE, 21*st April* 1911.

No. XIII.—LARGE HEADS OF MALAY SAMBAR AND BROW ANTLERED DEER.

I measured the horns of a Malay Sambar *(Cervus unicolor equinus)*, the property of Mr. Stile of the Burma Oil Co. at Magwe, and they far exceed the record mersurements I sent you some time ago (B. N. H. S. Jour., Vol. XIX, p. 254). They are: left horn 38″, right horn 37½″; girth 10″; tip to tip 19″, brow tine 22″.

I recently shot some thamin *(Cervus eldi)* in the Prome district and the largest head measures: left horn 40″; brow antler 17″, circumference 6″. Right horn 41½″, brow antler 17″, girth 6′, Points 6 × 7. Tip to tip 19″, spread 35½″. Height at shoulder 44″.

Will you please tell me what constitutes the record for thamin?

H. J. DAVIS, F. G. S.
Geologist,
BURMA OIL COMPANY, LIMITED.

YEUANGYAUNG.

[The Sambar head is three inches longer than the previous record and with much longer brow tines.

According to the *Records of Big Game*, 1907 Edition, the record Thamin head is—length 42′, circumference 5″, tip to tip 29″, width inside 24″, points 3 × 2.—EDS.]

No. XIV.—CROW AND ITS FOOD.

In order to study the habits of some carrion-feeding birds, I happened, in December 1910, to pay a visit to Dhappa, a suburb of Calcutta, where all the refuse of the town is thrown. While there, my attention was attracted by the movements of a Crow *(C. splendens)*, and on close examination, I noticed that it was feeding on aquatic insects, which it captured in a very peculiar manner from a large pool of dirty water. It hovered over the surface, at a height of about 15 feet, with its head down, and when an insect attracted it, it would plunge into the water, only to rise and repeat the performance again. The insects were caught with the beak, and during the downward swoops half the bird's body used occasionally

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to be submerged in the water. I had a long distance to go that day and was unable to devote much time to this interesting bird, which seemed to have adopted a new method of obtaining its food. And what is more, it was no "prentice hand" at the game. Its whole proceeding was so like that of a kingfisher, that I could not help thinking that this was a typical example illustrating how a change in the conditions of life may lead to the development of a new instinct, which, if continued for a sufficiently long period, might, as remarked by Romanes, alter the ancestral instinct to meet the requirements of a novel environment.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

CALCUTTA, 27*th February* 1911.

No. XV.—NOTES RELATING TO THE HABITS AND NIDIFICATION OF THE BLACK-HEADED SIBIA, *LIOPTILA CAPISTRATA*, (VIGORS).

The Black-headed Sibia is a common bird throughout the North-West Himalayas, and is very abundant in the neighbourhood of Simla. It frequents the outer ranges of these mountains between 5,000 and 8,000 feet, but is most plentiful at about 6,000-7,000 feet. It is a permanent resident throughout its habitat.

Hill-sides and ravines covered with dense, moist forests, especially oaks and other large trees, thickly coated with moss, are its favourite resorts. It is strictly arboreal, keeping generally to high trees, though occasionally it is to be seen on small ones, and also on bushes. It is very active; constantly moving in and out of the smaller branches, or hopping along the larger ones. When searching for food, it frequently clings to a twig, and turns upside down like a Tit. When alarmed or startled, the crest is erected, and a harsh danger note emitted.

During the summer months it is usually to be seen either singly or in pairs, but at other seasons in small parties of three or four. It is a very noisy bird, and one of its loud shrill, ringing notes, which may be likened to the syllables "tīrī-rōrē-rōrē-rēē" is to be heard throughout the year. Hutton has syllabized another of its notes as "tîttêreê-tîttêreê-twèèyò," the last, as observed by Scully, "being uttered after a short pause, and in a more subdued tone." Major Magrath remarks:—"The note of this Sibia is a single pretty whistle pitched in a high key, and repeated four or five times rapidly. At a distance it sounds like the tinkling of a little silver bell. When hunting for food, the note is a soft rattling chuckle. In addition to its characteristic note of a very high pitched and quickly repeated "ting," "ting," "ting," it has an alarm note like the Thrushes (*Merula*), only more rapidly repeated, and not so loud."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

It is a shy creature, though at times I have noticed it feeding on trees, growing by the side of public roads, and apparently quite indifferent to the passers below.

Insects appear to constitute its chief diet, but the gizzards of several that I have examined, from time to time, contained berries, seeds, and other vegetable matter. The Rhododendron trees, when in flower, have a great attraction for these birds, and sometimes as many as half a dozen or more may be counted on a single tree, eagerly searching for insects, which are likewise attracted by the flowers. In order to secure these insects, the birds plunge the whole of their heads into the flowers, and getting the pollen smeared on to their heads and cheeks, present, at close quarters, a most comical appearance. Any little stray Tit or Ixulus, which happens to visit a tree on which these Sibias are feeding, is immediately driven away in a most pugnacious manner.

References to the habits of this bird are meagre, but I have been able to collect the following:—

Hutton states:—"At Mussoorie this bird remains at an elevation of 7,000 feet throughout the year, but I never saw it under 6,500 feet."

Jerdon writes: "It is one of the most abundant birds about Darjeeling. It frequents the highest trees, climbing up the larger branches, and clinging round and below the smaller branches, almost like a Woodpecker or Nuthatch. It is often seen alone or in pairs, but occasionally in small parties, and is constantly uttering its twittering call, often answered by one at some little distance. It is very fond of concealing itself in the thick masses of Epiphytic plants found on all lofty trees in Sikkim, and its favourite food is the fruit of the *Epiphytic andromedæ*, so abundant about Darjeeling; it occasionally, however, picks insects from moss or crevices of the bark. I on one occasion saw it at Kurseong, 4,500 feet high, in winter, climbing up and down the thatched roof of a bungalow."

Stoliczka in his Ornithological Observations in the Sutlej Valley says:—"Rare about Kotegurh between 5,000 and 7,000 feet; chiefly frequents brushwood and low forests; generally feeding on insects."

Scully in his contribution to the Ornithology of Nepal remarks:—"Common on the hills round the Nepal Valley, at elvations of from 6,000 to 8,000 feet, but never seen in the central woods; in winter it is also common in the upper part of the Chitlang Valley. It principally affects large tree forest, but is often found in dense bushes on steeply sloping hill-sides; it is fond of the moss-covered branches of the large trees, to which it occasionally clings head downwards. In winter it is social, very bold and noisy, its cry then resembling the scolding alarm note of *Pycnonotus pygæus*, but louder and more harsh. In the breeding season, May and June, only single birds or pairs are seen."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Gammie observes :—" As might be expected from the bird's habit of feeding on the insects on moss-covered trees in moist forests, the nests were in forest by the side of streams.'

Oates notes :—" Frequents high trees, feeding on fruit and insects. Found throughout Himalayas from the Hazara country to Bhutan at elevations of from 5,000 to 8,000 feet."

Major Walton in his Notes on birds collected in Kumaon, says : " Very common, especially on the edge of forest. It has a very loud, shrill song, which it sings perched upon some conspicuous branch. Besides this, it has a variety of very harsh notes."

I think the measurements given by Oates in the " Fauna" for this species are a little small. Selecting three Simla specimens at random in my collection, I find that the *length* varies from 9·4″ to 9·9″; the *expanse* from 11·5″ to 12·6″; the *wing* from 3·9″ to 4·25″; the *tail* from 4·25″ to 4·75″; the *bill from gape* from 1′ to 1·05″; and the *tarsus* from 1·1″ to 1·45″. Of course the case may be different with a large series of birds from various parts of these mountains, but judging from the measurements given by Scully (S.F. Vol. VIII, p. 292) of 18 Nepal birds, it would seem that specimens from the Eastern Himalayas are, on the whole, slightly *smaller* than those found westwards. Hume, however, commenting (Rough Draft, p. 267), on the separation by Gray of the Western bird from the Nepal form as a distinct species, under Hodgson's name *Sibia nigriceps*, observed that the *only* difference which he could detect was that eastern specimens were a shade brighter coloured.

The female in this species is the smaller bird.

The mouth is pale fleshy.

In the description of this species, Oates makes no mention of the facts that the feathers of the head are white shafted for their basal halves, and that the chin feathers are whitish, or very pale fulvous (more so in females) passing into the rufous of the breast. Again in the females, the head feathers are sometimes dark sooty-brown. The collar round the *upper* portion of the neck is not *bright* but *pale* rufous. The lesser wing-coverts in my specimens are not *rufous*, but *dark brownish-grey* mixed with black; the primaries are distinctly insinuated towards the tips; and the tertiaries, besides being pale shafted for their entire lengths, are usually edged with black on the inner margins.

On three or four occasions, I have had the good fortune to witness the courtship of these birds, which is rather amusing. One runs, or rather hops, along a branch, with drooping wings and cocked tail, till it reaches its mate, and then both birds sit, side by side, with ruffled feathers for a few seconds, after which this process is repeated over and over again ; the birds eventually flying off to another tree, and commencing afresh as before. A peculiar sharp twitter or chuckle is emitted by one of the birds during these antics, but the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

latter all end here, and must presumably be only the "preliminaries," for I have never yet seen a pair *in copula*. I must not forget to mention here two other points. The first is that I have usually noticed more than *two* birds taking part in these courtships, and the second is that the hens in this species sometimes appear to court the cocks. On the 25th June 1911 I came across three birds—a *large* one, and two *small* ones—indulging in the antics already described. The large bird was a cock, and the two small ones were, I think, hens; and I must confess that their behaviour gave me the impression that they were fighting with each other for the possession of the male. One of the small birds drove the other small one away, and then she squatted on a branch by the side of the large bird. Just as they got together, I shot the couple, and on dissection, they turned out, as I suspected, to be of the opposite sexes. Now the bird that had been driven away was, as already stated, a *small* bird, and I think there can be little doubt that it was another female. In spite of repeated attempts, however, I failed to secure it, for had I succeeded, all uncertainty in the matter would have been removed, still I have no doubt whatever in my own mind that it was a *female*. All this behaviour on the part of the hens sounds very unladylike, I know, and is at variance with Darwin's theory of Sexual Selection, to wit, that among all species of animals there is a competition among the males to secure females as mates, but I take this opportunity of putting on record what I think to be true.

Hume states that this bird "lays during May and June, and perhaps part of July:" the earliest and latest dates mentioned in his work "Nests and Eggs," (2nd edition), on which eggs were found are:—

Earliest date	21st May	Sikkim: 2 fresh eggs.
Latest date	10th July	Naini Tal: this nest was really found on 11th July "containing two chicks not a day old."

My *earliest* and *latest* dates are 9th June, (3 semi-incubated eggs), and 7th August (3 fresh eggs), respectively. I may, however, mention that on the 9th May I found a nest containing two young ones, about a week or ten days old. The eggs in this case must have been laid some time during the *third week of April*, but this is exceptional. In these parts May and June are undoubtedly *the* months during which the majority of these birds lay; most eggs are, however, to be taken in June. In regard to the breeding time of this species, Captain G. F. L. Marshall notes:—"Nest building commences May: Eggs taken at Murree on 5th June, in Kumaon on 29th June and 3rd July: season ends."

These Sibias never breed in company, and they only rear one brood annually.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The nests are generally built either on trees or bushes on the edges of forests, though it is by no means unusual to find them towards the middle, or in the heart of a thickly covered hill-side.

The nests are placed either at the ends of branches, or on one of the upper forks, or where several small twigs shoot upwards from a horizontal branch, and no matter what their position, they are, as a rule, well concealed. In fact, they are very difficult nests to find, but the birds themselves sometimes give away the show by uttering a sharp twitter, if a person happens to approach too close to the tree containing the nest. And here I take the opportunity of giving other oologists a "tip." When the hen is sitting on eggs, the cock generally hangs about in the vicinity, and when his loud notes are heard *constantly* issuing from a *particular* tree, it is always best to examine carefully, not only that tree, but all the other likely ones close by: by observing this, I have been rewarded on two or three occasions by finding the nests-on the last, I remember getting a beautiful clutch of three fresh eggs.

So far as my experience goes, the trees which are preferred in Simla for nesting by these birds are either Oaks or Rhododendrons. Only once I have found a nest placed on a small Holly.

The heights of the nests varied from 8 to 60 feet, but the average of 17 nests was 26½ feet.

The nests are neat cup-shaped structures, composed exteriorly of a layer of moss, in which a good many leaves, strips of bark, and cobwebs are occasionally incorporated, and lined interiorly with the roots of the maiden-hair fern and other plants. One nest, which I have in my collection, is of a very unusual shape: it is something like an inverted cone, and is 7½ inches in height. It was placed against the trunk of a medium sized Rhododendron, and was beautifully concealed by some twigs shooting at right angles from below it. The drawing below shows the difference in shape between this nest and that of a normal one.

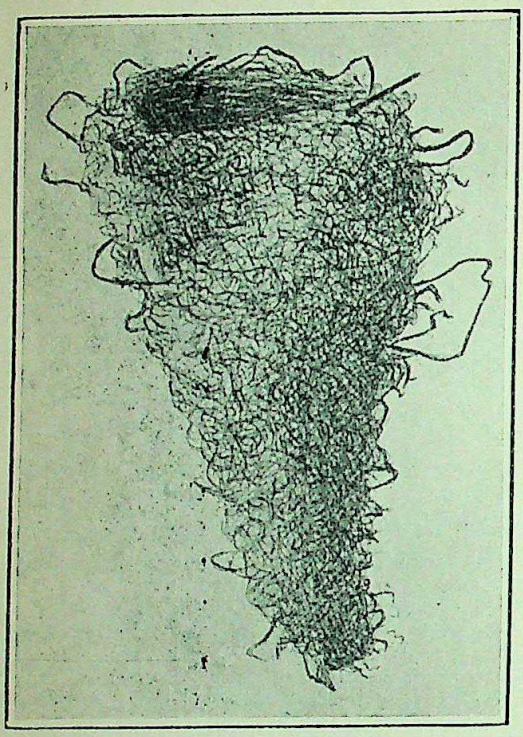
The materials composing the nests are firmly interwoven together, and the structures themselves are securely attached to the surrounding twigs. Some of the nests situated at the extreme ends of branches appeared to occupy most precarious positions, but I have never yet known one to be blown down by the wind.

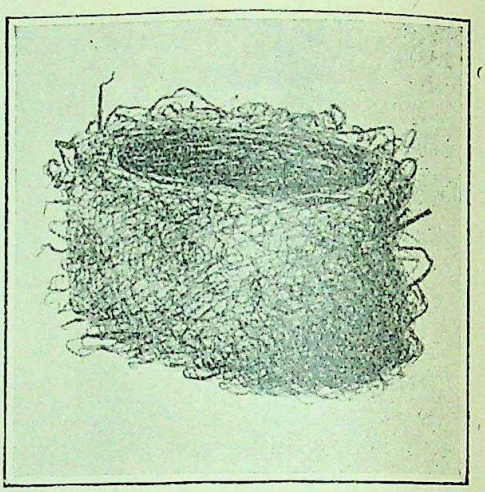
The dimensions of six nests (excluding the abnormal one) were as follows:—

Diameter of egg-cavity	3″
Depth of ditto	varies from 1·75″ to 2·2″
External diameter .. .. .. „ „	4·25″ to 4·5″
Height.. .. .. „ „	3″ to 3·5″
Thickness of bottom .. .. .. „ „	1″ to 1·6″
Thickness of sides .. .. .. „ „	·65″ to ·75″

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri





Both birds share in carrying materials, and in building operations. I have, however, on one or two occasions noticed that the cock brought the materials, and the hen alone was the architect. Once a site has been chosen, building operations progress with great rapidity, but I have not yet been able to ascertain the exact length of time taken by the birds in constructing a nest. When the latter has been completed, a very short period seems to elapse before the first egg is laid.

These Sibias have a peculiar habit of deserting their nests on the least provocation—*merely climbing* the tree and only peeping into the nest in some cases, is enough—and it is, therefore, most difficult to make any observations. I have been unable to ascertain the time which elapses between the laying of the eggs, but the hen begins to brood after the first egg has been laid. She is very wary, and genearlly leaves the nest long before a person gets to the tree. So far as my experiences go, I do not think that the cock takes any part in the hatching of the eggs.

The number of eggs varied from 2 to 3. In one nest I found a solitary chick wriggling out of its shell, and the largest number of young found in a nest were two.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Owing to the difficulties of examining the nests referred to above, I am unable to give the period of incubation, but I doubt whether it exceeds 14 days.

Both birds feed the young, but there are gaps in my notes as to how long the latter remain in the nest. I have never noticed them following the old birds about, but have no doubt that they must do so for some time like other young birds.

The only reference to this bird's nest which I have been able to find, since the publication of the 2nd edition of Hume's "Nests and Eggs" is that by Lt.-Col. R. H. Rattray in his "Birds' Nesting in the Murree Hills and Gullies" (Journal, Bombay Natural History Society, Vol. XVI, p. 423). He says: "The Black-headed Sibia is fairly common. Nests very hard to find; they are generally high up in a dense fir tree. The nest is a very neat structure, and generally placed low down in a bough. Eggs pale blue, in some almost white, spotted and boldly blotched with red marks like dried blood, and a few subsidiary markings greyish purple. The birds often give away the nesting site by keeping up a shrill cry. They desert the nest if the tree is climbed, even when the nest is not touched by hand. I have taken nests both at Murree and Dungagali."

On looking through my notes relating to the various nests taken of this species, I reproduce one, under date 8th July, which is rather curious "Found a nest on 20th June, containing two fresh eggs, placed at the junction of several upright twigs shooting from the horizontal branch of a small Rhododendron; exact height from ground 25 feet: elevation 6,000 feet: hen shot off nest. Both nest and eggs removed. On passing this spot a few days afterwards, *viz.*, on 8th July, I happened to look up at this tree, and was surprised to see that another nest had been constructed in *identically the same place*, and that it contained 3 fresh eggs! The hen was sitting at the time."

The eggs of this bird are, perhaps, the prettiest ones I have ever seen up to this. For a detailed description of them, I would refer the reader to Hume's admirable account in his "Nests and Eggs of Indian Birds," 2nd Edition, Vol. I, p. 134.

In length my eggs varied from ·95″ to 1·12″; and in breadth from ·67″ to ·75″; but the average of 14 specimens measured was 1″×·71″.

The weights of 8 *fresh* eggs were: 72, 75, 60, 63½, 66, 62, 65 and 68 grains. Average weight = 66·4 grains.

The weights of 3 semi-incubated eggs were: 59, 56, and 54 grains. Average weight = 56·3 grains.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

"CARLTON GROVE,"
SIMLA, S. W., 19*th July* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XVI.—A NEW BAR-WING FROM BURMA.

In the Bulletin of the Brit. Ornith. Club Vol. XXVII, p. 9., Major H. H. Harington described a new Bar-wing from Burma as follows :—

Actinodura radcliffei. sp. n.

Adult male.—Differs from *A. ramsayi* (Walden) in having the forepart of the head and crest darker ferruginous, the general colour of the upper parts ochraceous, instead of cinereous olive-brown, and the throat, breast and sides of the body rich ochraceous ; the abdomen conspicuously white, and the feathers of the throat have rather conspicuous blackish shaft-streaks. Iris brown; bill dark brown; legs pale brown.

Total length about 9·7 inches; culmen 0·8; wing 3·6; tail 5·0; tarsus 1·2.

Habitat—Ruby Mines District, Upper Burma.

Type.—♂ Ruby Mines District, 24-3-1910.—Obtained by Major H. Dolmé Radcliffe. Presented to the British Museum (Natural History).

No. XVII.—CURIOUS BEHAVIOUR OF A MYNA.

While in camp in a mango bough last cold weather, I noticed my tame Myna going through most curious antics. He first bent his tail down almost perpendicular to the ground, and then putting his head between his legs rubbed his beak up and down the tail feathers, so vigorously that he fell nearly head overheels several times. On looking more closely, I saw that he was picking up one by one the large red ants which live on mango, and killing them by rubbing them against the stiff tail feathers in the way I have described. He killed or maimed a dozen or more in this way while I was watching him. He did not attempt to eat them.

F. B. SCOTT, LIEUT.

MUSSOORIE, 19*th June* 1911.

No. XVIII.—NOTES ON BIRDS ROUND RAWAL PINDI.

Cross between *Molpastes leucogenys* and *M. intermedius.*

On June 22nd I found a bulbul's nest in a bush, and seeing that the sitting bird had red undertail coverts, I put it down as *M. intermedius.* But when she left the nest she was at once joined by a *M. leucogenys.* Next day I assured myself that this was the pair and secured both birds, to find that the hen was not *M. intermedius.* On comparison with other specimens, it is clear that the hen herself must be a hybrid—roughly described it is of the size and appearance of *leucogenys*, but the ear coverts are light brown, and the undertail coverts red tinged with yellow. The eggs, 3 in number, were partly incubated and small, measuring 2·10 × 1·70, 2·25 × 1·75 and 2·10 × 1·65, cmm. respectively. The nest was made of coarse dry grass, etc., and lined with finer grass, being rather more substantial than most nests of *leucogenys.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Niltava sundara, Hodgs., at Murree.

In the Fauna, Vol. II, p. 41. The Himalayan distribution of this bird is given as "from Simla to Assam," hence it may be of interest to note that in May and June of this year I found this one of the common birds in the jungles at Murree. It frequents bushes and the lower branches of trees, and when one approaches near to its nest, it has the habit of sitting in one spot and uttering at intervals a dull squeaking note, so that it is hard to spot. It occasionally spreads or raises its tail. The nests are hard to find, their sites being similar to those adopted by English Robins when building on or near the ground: they are of moss, lined with fine roots or stems, and the eggs are similar to the lightly marked variety of Robin's eggs.

I also took on May 30th a fresh clutch of four eggs of *Petrophila erythrogastra* (Vig.) the chestnut-bellied Rock Thrush whose western limit is given in the "Fauna" as Chamba. The nest was composed entirely of pine needles and was placed in a small tunnel in a bank. They were pinkish buff in colour, closely speckled with a darker shade of the same.

H. WHISTLER,
Indian Police.

RAWAL PINDI, 30*th June* 1911.

[In Captain Whitehead's paper on the birds of Kohat, which was reprinted from the Ibis in the Journal, Vol. XX, p. 182, there are some remarks on a series of hybrid bulbuls, which are said to be crosses between *M. intermedius* and *M. leucogenys*. Mr. Whistler's bird, which he has kindly forwarded for examination seems to agree fairly closely with No. 689 ♀ of Captain Whitehead's series.

From *M. intermedius* this hybrid differs in being rather lighter, the abdomen dirty white and the flanks grey. The ear coverts are a pale washed out brown and the under-tail coverts are yellowish orange shading into washed crimson at the tips.

N. B. KINNEAR.]

No. XIX.—NOTES ON THE NIDIFICATION OF *MICROCICHLA SCOULERI*, (Vigors), THE LITTLE FORKTAIL.

The eggs of the Little Forktail have, so far as I am aware, not hitherto been taken, and the following particulars in regard to its nidification will, doubtless, be of considerable interest to naturalists.

On the 13th May 1910, while out searching for nests by the side of a stream in the neighbourhood of Simla, at an elevation of about 6,500 feet, I came across a pair of these birds, which appeared to be courting, and while watching them, I saw them twice *in copula*. Making sure that the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nest was somewhere in the vicinity, I stationed men to watch the spot for several days, but in spite of a most diligent and exhaustive search, the nest could not be located, and the birds subsequently deserted this portion of the stream.

The following year one of my hunters reported on the 24th April that he had found a nest of this species by the side of a stream, about three miles from Simla in a southerly direction, near the Behar village in Keonthal territory, and that it probably contained eggs, as the old bird was sitting hard. On the 26th instant, accompanied by my friend, Mr. W. A. Hughes, I visited the spot—an ideal haunt for this intrepid little bird. The water from the stream rushed down a wall of rock fully 125 feet or more in height, and fell below with a deafening noise in a dense mass of foam and spray. Here about 50 feet above us, in a small niche in the face of the wall by the side of the water, and over which a small slab of stone projected, was placed the Forktail's nest. Some moss was growing below it, and as the sides of the latter were composed of the same material, it blended admirably with its surroundings. So well was concealment effected, that it would have been utterly impossible to have discovered the nest, unless betrayed by the birds themselves; and, indeed, its exact position had only been determined by watching their movements.

On our arrival, only one bird was noticed searching actively for food along the slippery wall of rock, and just as we got to the bottom of the Fall, the other one, apparently alarmed by our presence, hurriedly left the nest. I had decided that the shooting of the bird (for although by now the identification was complete, yet I wished to leave no grounds for doubt), should devolve on Mr. Hughes, and right well did he do his share of the business. After leaving the nest, the old bird (it turned out subsequently to be the hen) flew down stream for a few yards, and settled on a prominent stone, thus affording an excellent shot, and which my friend readily availed himself of. Mr. E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U., very kindly identified the skin for me, and unhesitatingly pronounced it to belong to our bird.

The nest was reached by means of a rope thrown from above, and contained one egg on the point of hatching off, and one young, about a couple of days old.

The egg measured ·8″ × ·6″; and its weight was 31 grains.

Now, curious as it may appear, among the eggs of the Western Spotted Forktail (*Henicurus maculatus*) two distinct types of colouration are generally to be found in the *same* nest, *viz.*, those having a greenish-white ground colour, marked with yellowish-brown (and the majority are of this type), and those having a dingy pink ground colour, marked with reddish-brown. The egg of our bird bore a faint resemblance to the latter type.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The elevation of the spot was about 5,500 feet.

Keonthal State, 29th April 1911.—Two more nests to-day: both situated in niches of rocks by the sides of large waterfalls, and well concealed. They were only discovered by watching the movements of the parent birds.

Elevation about 5,000 feet.

(*a*) Could not unfortunately be approached on account of its dangerous position. It probably contained either hard set eggs, or young ones just hatched, as the old bird sat very tight, and only left the nest after several large stones had been rolled down from above the Fall.

(*b*) Contained 3 eggs on the point of hatching off. Compared with the positions of the other nests, this one was easy of access, and was not more than about 12 feet high. The nest, as already stated, was placed in the niche of a rock, and was completely hidden by a large quantity of water which fell continuously over it. So well was it concealed that, although I was not more than half a dozen paces from it, I could not see it. To get to their home, or out of it, the birds had invariably to pass through this dense sheet of water!

The identification of the bird was a most trying experience. On my arrival at the spot, I had noticed a bird dart out of the water, but it was impossible to say with certainty what it was. Fortunately there was a large boulder just in front of the nest in the middle of the stream, and I took advantage of this by hiding behind it. The water was up to my ankles, and my cramped position soon began to tell on me. After a few minutes of waiting, the old bird appeared on the scene, and one would have thought that with hard set eggs, she would have got into her nest at once. But it was not so with the Little Forktail: she had no intention whatever of being rushed in this fashion, and thus giving away the show. For more than an hour I was kept in suspense, and was beginning to think that she was not the owner of the nest. At one time she would flit from rock to rock, at another, dart into the water after a passing insect. Now she would gingerly plume her feathers, now sit with them ruffled, and assume a sort of unconcerned expression—the eggs, although exposed for so long a time, apparently gave her no cause for anxiety. My patience was nearly exhausted, and I had almost given up all hopes, when her Ladyship apparently recollecting that her eggs were getting cold, after a few hops along the rocks, suddenly darted through the sheet of water, and settled down into her nest.

The nests in both cases were deep cups, composed exteriorly of moss, and lined with fine moss-roots, and dead and skeleton leaves: in other words they were simply small editions of the nest of the Western Spotted Forktail (*Henicurus maculatus*). I have at present before me four nests of the latter, and comparing these with those of our bird, I can find absolutely no difference whatever, except for size.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I find a note recorded in my Journals with reference to the nests of the Western Spotted Forktail that they have, as a rule, a good deal of damp earth mixed in their bases, and that this apparently helps towards concealment by keeping the moss fresh and green. The same was the case with the Little Forktail. When *in situ* the moss composing the external layers of the nests was quite fresh and damp; by the time they reached home, the moss had dried up, and began to drop off, and the structures assumed a shrivelled up appearance.

For purposes of comparison, I give below detailed measurements of the nests of the two species of Forktails :—

Details.	Henicurus maculatus. (Four nests).	Microcichla scouleri. (Two nests).
Diameter of egg-cavity ..	3″	From 2·25″ to 2·4″
Depth of ditto ..	From 2″ to 3″	„ 1·6″ to 1·75″
External diameter	„ 5″ to 5·75″	„ 3·6″ to 4·5″
Height	„ 3·25″ to 4·5″	„ 2·25″ to 3·5″
Thickness of bottom ..	„ ·9″ to 1·5″	„ ·6″ to ·9″
Thickness of sides (average)	„ 1″ to 1·5″	„ ·65″ to 1″

The eggs of this find measured ·85″×·6″; ·83″×·58″; and ·83″×·6″; and their weights were 1 @ 31 grains, and 2 @ 33 grains each.

Summing up the results of the two nests, I find that the eggs varied in length from ·8″ to ·85″; and in breadth from ·58″ to ·6″; but the average measurements of the 4 eggs were ·82″×·59″; and their average weight was 32 grains.

In shape the eggs were elongated ovals, somewhat pointed towards the small end; the texture of the shells was fine, and they had very little gloss, if any. Their ground colour was almost white, or perhaps *very* pale dingy pink, and they were thinly spotted and speckled, chiefly towards the large end, with reddish-brown. In one egg the spots and specks have a tendency to form an irregular zone.

The number of eggs laid by this species apparently varies from 2 to 3.

Since writing these notes Mr. E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U., informs me that he recorded the finding of this bird's nest some years ago both in the "Ibis", and in the Bombay Natural History Society's Journal, and that he is under the impression that B. B. Osmaston also recorded finding the nest in the latter paper. Mr. Baker adds "the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

eggs have been taken by Col. Ward in Kashmir; I think by S. L. Whymper in Garwhal; and possibly by Davidson and Col. Wilson in Kashmir, but I am not sure of these two last."

P. T. L. DODSWORTH, F.Z.S. M.B.O.U.

"CARLTON GROVE" SIMLA, S. W.,
19*th May* 1911.

No. XX.—NESTING NOTES FROM LOWER BURMA.

On 13th April 1911 I found the nest of the Tweedale Scimitar Babler (*Pomatorhinus nuchalis*). It was placed on a ledge of rock by the side of the circular road at Thandaung where there is a high cutting. The hill above is covered with heavy bamboo jungle and the dead leaves falling have collected on the ledges of the rock. The nest was cup-shaped almost covered with the dead leaves and was $3\frac{3}{4}''$ deep by $3\frac{5}{8}''$ in. diameter (inside). It consisted of dead bamboo leaves loosely rolled round the cup and wrapped round with narrow leaves of a coarse grass between the layers of the bamboo leaves to keep them together. Inside dry grass bents and finished with fine grass. The eggs were 3, measuring $1{\cdot}01'' \times {\cdot}75''$, a pure white with a slight glass blunt at larger end. See Vol. XV, p. 519.

On the 19th April I came across the nest of the Bar-tailed Cuckoo Dove *Macropygia tusalia* (1312). The nest of sticks was placed on bracken leaves not far from the ground in dense bamboo and undergrowth. Higher up the hill, after the undergrowth had ceased, in bamboo jungle consisting of separate clumps of six, eight or ten bamboos and quite open, I saw a pad of moss where the bamboo shoots take off in a cluster. On going up a long-tailed dove flew off. I waited 25 minutes and shot it practically on the nest. This consisted of a flat pad of moss almost quite hard about twelve feet up the bamboo. It was difficult to get the egg as I expected it would roll off every minute as we telescoped the bamboo.

The egg measured $1{\cdot}26'' \times {\cdot}84''$, a perfect ellipse and cream tinged with very faint coffee colour. The bird was the Little Malay Cuckoo Dove, *Macropygia ruficeps* (1314).

S. M. ROBINSON.

10, HALPIN ROAD, RANGOON,
13*th July* 1911.

No. XXI.—SOME WINTER VISITORS TO RAWAL PINDI.

It may be of some interest to record the following birds as having come to my notice in Rawal Pindi during the past winter. The Wall Creeper (*Tichodroma muraria*) has been common in the dry stony nullahs that intersect the country to the south of the Cantonments. I first noticed it on

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the 25th October and from that date onwards have seen several. On 21st March I secured a male just completing the moult in to breeding plumage at Gujar Khan, some 25 miles south-east of Pindi. In flight they remind one somewhat of the Hoopoe, so far as shape and manner go. Whilst climbing they flirt their wings and call often, especially after being disturbed.

The Reed Bunting (*Emberiza schœniclus*) has been numerous at Kunna jheel and I have also met with it in the nullahs near the R. Sohan, on bare stony ground interspersed with a few bushes.

Himalayan Goldfinches (*Carduelis caniceps*) were common for a short time in February; they were generally to be met with in Shishain trees bordering country roads.

In January and February there were large number of the Blue headed Redstart (*Adelura cœruleicephala*) in cantonments, and about the same time I saw a few white-capped Redstarts (*Chimarrhornis leucocephalus*) and Plumbeous Redstart (*Rhyacornis fuliginosus*) in the rocky nullah of the river Ley, a short way above its junction with the river Sohan.

I also obtained the following birds:—The Brambling (*Fringilla montifringilla*) female, 7th January. The green-backed Tit (*Parus monticola*), 28th January, male: a pair seen. The large Cuckoo-Shrike (*Graucalus macii*,) female, 21st February. The Missel Trush (*Turdus viscivorus*) male, 29th January; male, 19th February. The black throated Accentor (*Tharrhaleus atrigularis*) one specimen, 7th February.

H. WHISTLER, INDIAN POLICE.

RAWAL PINDI.

XXII.—SEASONAL MOVEMENTS OF THE HIMALAYAN GREENFINCH (*HYPACANTHIS SPINOIDES*).

I had hoped to have been able to reply decisively to Mr. Dodsworth's query about Himalayan greenfinches, but owing to pressure of work I have not been able to do very much this year. I can say, however, that two years ago there were young greenfinches below Dagshai in May, and I then came to the conclusion that they had bred at the lower level in April, and could proceed to higher altitudes to breed in July, as they do in the Murree Hills. Mr. Dodsworth proved that those birds bred beyond Simla in July, and I think I am correct in stating they breed at a lower level in April.

These birds are common all round Dagshai in flocks from November to March.

R. B. SKINNER, CAPT., R.E.

DAGSHAI, SIMLA HILLS.
29th May 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXIII.—OCCURRENCE OF *HEMILOPHUS PULVERULENTUS*, (TEMM), THE GREAT SLATY WOODPECKER IN THE NEIGHBOURHOOD OF SIMLA, N.-W. HIMALAYAS.

In the "Fauna," Birds, VII, III, page 70, the range of this species *westwards* along the Terai and base of the Himalayas is given as "*Kumaon or, perhaps, Dehra Dun.*" It may, therefore, be worth recording that late in August 1907, I came across a party of these Woodpeckers, not more than a mile and a half from Simla, on what is locally known as the "Long road to Annandale," at an elevation of about 6,800 feet. There were four birds, two large ones and two small ones, and judging from the behaviour of the latter, there seemed little doubt that they had recently left their nest, and were following their parents about.

It is possible that these Woodpeckers had bred in the neighbourhood? I stood and watched them feeding on some pines and low oaks for more than half an hour. They were not shy, and allowed me to approach fairly close to them. Unfortunately, I did not have a gun with me at the time, so was unable to procure a specimen. I have never seen this species here either before or since the time mentioned above.

The birds appeared to be moving in a S. W. direction.

P. T. L. DODSWORTH,

F.Z.S., M.B.O.U

"CARLTON GROVE,"
SIMLA, S. W., 14*th June* 1911.

XXIV.—HORNBILLS DEVOURING YOUNG PAROQUETS.

Some years ago I wrote a note for the Journal commenting on the apparent immunity from foes of certain Indian animals and speculating as to what causes prevented their unlimited increase. No one came forward to throw any light on the subject and the point to me still appears a mystery.

One of the animals I mentioned was the common paroquet, however I have now discovered at least one enemy of the latter, and as the fact is not mentioned in Jerdon it may possibly be worth inserting in your notes.

For the last few days my attention had been attracted by some grey hornbills (*Lophoceros birostris*) visiting a hole in a large siras tree, in my garden, and inserting their heads as if to feed young ones. I did not think this could be the case, however, as I had previously seen paroquets coming out of the same hole. I accordingly sent up a boy who reported that there were young paroquets, but that he could not get his hand in.

The next day on my return after a morning's work my man reported that the hornbill had again been at the hole and had succeeded in extracting a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

young paroquet which it had seized by the head and killed. He had then driven it off by throwing a stone at it whilst it was proceeding to pull its prey in pieces.

He showed me the young bird, which bore marks corroborating his story.

Perhaps this trait may be known to other readers, but it is quite new to me.

A. NEWNHAM, LT.-COL., I. A.

JULLUNDER, 17*th April* 1911.

XXV.—JACK SNIPE IN THE CAWNPORE DISTRICT.

With reference to the description of the Jack-Snipe *Gallinago gallinula* and its habits in the May Number of the Journal, would it be of any interest to you to have my figures for the past season of the relative number of the Jack and Fantail snipes shot by me in this district?

They are as follows: out of a total of 204 couple 65 couple were Jack. I think this probably represents a greater proportion than the numbers of Jack seen would bear to those of the Fantail, as on several occasions large wisps of the latter went away without being shot at. Still these figures show that this season at least Jacks were very plentiful in this district.

W. B. SPALDING, CAPT., R.A.

CAWNPORE, 26*th May* 1911.

No. XXVI.—NESTING OF THE CINEREOUS VULTURE (*VULTUR MONACHUS*) NEAR QUETTA.

When I was quartered in Quetta some years ago, I had the eggs of this vulture brought to me on more than one occasion, but I had never myself procured the egg.

This year having heard from a Pathan that he knew of a nest, I made arrangements to go out and see it. April the sixteenth was the date. I started early from my bungalow and drove about 14 miles to the end of the road, and then took to the hills walking; after about three hours up and down hill, we reached the tree on which the nest was placed; this was on old juniper about 40 feet high and 7 feet through at the foot, and was situated on the steep hill side about 8,000 feet above sea level; it was in a very wild place with high cliffs and steep slopes all round it. The nest itself was placed right at the top of the tree, so that the bird sitting on it was visible from a long way off. I climbed up to the nest with some difficulty, as the tree was extremely thick, and when I got to it, I found it by no means an easy task to see into it owing to its immense size; however, I managed it at last and then found to my disgust that there was a young bird in it. I should judge about one week old.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The nest was an enormous mass of sticks, and was lined with smaller sticks, and strips of juniper bark, with a few feathers; the material of the nest would have filled a large cart, the measurements being approximately 3 feet thick at least, and 7 feet across the top, the latter being very nearly flat. The young bird was about the size of a pigeon and covered with black down. The nest and surroundings had an extremely strong and unpleasant musky smell. While I was at the nest the old birds made no attempt to molest me but circled about high in the air above me.

After I had come down from the nest, one of the Pathans, who was with me, said that he knew of a Lammergeyer's nest further up the same ravine; but as it was some way off, I sent him and another man to see if there was any chance of getting at it, arranging to meet them later on. When I did meet them I found that on the way they had found another nest of the Cinereous vulture, also on a juniper tree, and that after some difficulty, owing to the tree being placed in an extremely awkward position, half up a cliff, they had managed to get to it; and brought me one egg from it. The egg was of the usual type, white with rusty red markings all over it, thicker at the large end; these markings were very lightly laid on, and could easily be rubbed off with a wet finger. The egg was rather hard set. The man who climbed to the nest reported to me that the bird had come very close to him; but I think like all Pathans he was only making the most of his exploit.

Not long after the foregoing account was written, at the beginning of May, I was out on a shooting trip on the same hill, and found two more nests of this vulture; they were both situated in similar positions to that already described, at the extreme tops of large juniper trees growing on the hill side in solitary places, about 8,500 feet above the sea; the first nest had an egg in it, a very finely coloured one, but it was so hard set that I could hear the young bird chirping inside it, so I left it; the other had a young bird in it, I should judge about 10 days old.

T. E. MARSHALL, MAJOR, R.E.

QUETTA, 11*th May* 1911.

No. XXVII.—UNCOMMON BIRDS IN BURMA.

It will be of interest to all ornithologists, but especially those in Burma, to record that on the 29th of May last I procured at "Thandoung," situated on the Karen Hills, about 30 miles East of Tounghoo, elevation about 4,000 feet, a specimen of

The Rufous-belled Hawk Eagle, *Lophotriorchis kieneri*, No. 1209, F. B. I.—I shot this bird just after it had swooped and carried off one of a party of green pigeons I had been watching feeding on a fruit tree in some heavy

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

forest. The attack of the eagle was extremely sudden; I became aware of it by hearing a crash in the tree I had been watching and then hearing some large bird flapping its wings and free itself from the branches. This struggle was only momentary, and the eagle flew off heavily with a pigeon in its talons. It perched but a short-way off and I fired at it, never hoping however I was obtaining such a rare specimen. This bird has never, I believe, been recorded from Burma before. I only slightly wounded it, and I found it very troublesome extricating it from some very thick undergrowth into which it had fallen. It was very ferocious and, of course, catching it by the hand was out of the question. The Karen who was with me would not go near it. However in time, manœuvring with a long stick, I managed and got it under control, so as I could kill it without injuring the skin, which I have preserved and will forward it to you, with some other skins I collected at Thandoung for our museum as soon as the rains are over.

Another interesting fact to record is that

Tickell's Staphidia (*Staphidia strata*) No. 218, F. B. I., was found to be quite common at Thandoung. Very little seems to have been known about this bird at the time Oates described it. I did not realize how common it was, as it does not make itself at all conspicuous, and might be easily passed over for some other bird until a friend, Mr. Justice Robinson, who was with me in Thandoung collecting eggs, and myself had found about a dozen nests. Robinson did not know the species to which the nest belonged, but thought it was Tickell's Staphidia and set all doubt at rest by shooting a parent bird, and I later caught a bird in my landing net on her nest.

I learnt afterwards that I had not noticed the bird Tickell's Staphidia itself, as I had passed it over thinking it was a Tit or Flower-pecker. It has very much the same habits, going about in small parties and hunting amongst the leaves and branches for insects and keeping up a continual twittering.

This species in Thandoung invariably chose for its nesting place the banks of paths cut through the jungle, or in one instance I found a nest about 4 feet from the ground in a hole on the face of deep road cutting. The nests are usually cunningly concealed, though at times very conspicuous; generally we found them partially concealed behind a clod or tuft of moss or grass and built into any hole or shelf in the bank, but usually these holes near the top of a bank were chosen, so that the overhanging moss clods, etc., partially concealed it.

The nest is rather massive for such a small bird, being thickly walled with moss and rather loosely packed. The inside is a neat cup, lined with very fine grasses and their black stalks so very thin that they have the appearance of horse hair, obtained, I fancy, from the smaller clued ferns.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

None of the 7 nests I found between May 14th and 29th contained more than 3 eggs, and the eggs in all were fresh. One bird began laying on the 21st May. Nine eggs in my possession measure ·8 × ·6 and are white speckled with brown but the distribution of the spots varies a good deal. Some of the eggs have a regular zone of small spots round the larger end and spotted very sparingly elsewhere, others are spotted uniformly over the whole egg.

J. P. COOK.

THAYETMYO, *14th June* 1911.

No. XXVIII.—FALCON AND GULLS.

The other evening while on the harbour, I noticed a large number of gulls of the two common kinds here (the sooty and the small grey) flying in a state of great excitement.

Thinking they were over a shoal of fish, I put a telescope on to them and was surprised to see that the cause of the excitement was a falcon of the kind we know here as one that chases the wild pigeons. I suppose it is either the peregrine or laggar. One of these birds was attacking a grey gull with the utmost fury and drove it again and again into the water, where it hovered over the gull with its talons extended as if about to alight on it. Then the whole army of gulls would sweep down and carry away the falcon in the rush: the gull that was the object of the falcon's attentions would then rise and endeavour to join its companions and escape but the falcon extricating itself from the crowd repeated his attacks several times always driving the gull into the water whence he seemed unable to drag it. The gulls by repeated rushes eventually got their friend safely off and I saw the falcon fly straight away over the harbour to Shaik Othman. The two points that impressed one were the state of utter fatigue and weakness to which the falcon had reduced the gull by his pursuit, though one knows the great strength and wing endurance power of the gulls. I suspect that being overdriven for pace produced the distress. The second point was the unerring manner in which the falcon, when he came out of the scrimmage of gulls went straight for his victims seeming to know exactly where he should find it. I have seen the same thing when these falcons chase pigeons: their pursuit is relentless, and I should imagine generally successful; the gull would certainly have been killed had his companions not swept down on the falcon in the way they did and had he not been able to take to the water. Is not this a very uncommon circumstance? I should be glad to know, if such an attack has previously been observed.

S. E. PRALL, LT.-COL., I.M.S.

ADEN, *August* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXIX.—NESTING OF THE OSPREY OR SEA-HAWK.

Some three years ago I found a nest of these birds on Round Island, a lonely rock about 100 feet high on the seaward side of Aden. I have however not been able to make out when the rearing of the young takes place. The weather is too rough to permit of the landing on the rock throughout the year, so I suppose that like the vultures that breed on the cliffs here, the young were reared in the monsoon months. This year however a new nest has been built in the month of December at least, that is when I first saw it. I enclose a photo* of the rock and the two nests which are both on the top ridge and built of sticks brought from the Shumshum valley just opposite. I have never seen more than one pair of birds at this place, so conclude they are the same; there are several pairs fishing in and around the harbour and they are so tame that they will allow you to approach quite close in a boat. From observations made with glasses in this way and from fish picked up under the nest I note that when the osprey has taken a fish he places it longitudinally between his feet on arrival at his perch and commences at the head.

He will often throw the fish away after eating the head only, the small ribbon fish is one he often catches and to judge from what we have picked up under the nest throws it away after eating the head. I admire the discrimination shown as the ribbon fish is a mass of bones and altogether impossible.

S. E. PRALL, Lt.-Col., I.M.S.

Aden, *August* 1911.

* [The photo was too small for satisfactory reproduction.—Eds.]

No. XXX.—EUROPEAN GREAT BUSTARD IN CHITRAL.

On April 10th Captain R. A Lyall forwarded us a skin of a Great Bustard, *Otis tarda* which had been shot by Lieut. Stirling on 30th March. In a letter accompanying the skin Capt. Lyall remarks "I found that the Chitralis had got a name for the bird (dio dagh) though it was said to be very rare." The skin is that of an immature female with the pectoral band only showing slightly at the sides and not so distinct in Captain Simond's specimen.

N. B. KINNEAR.

Bombay, April 1911.

No. XXXI.—WOODCOCK IN KULU.

In Mr. Stuart Baker's article on the Woodcock, *Scolopax rusticula* in Vol. XX he states on page 15, four lines from the bottom, that: "the largest

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bag on record for India is that recorded by A. Graham Young in Hume and Marshall's *Game Birds of India*, 28 years ago. This bag was made in Tos Forests in Kullu." Now Mr. Graham Young never said that the bag of 33 cock was shot in the *Tos* Forests ; all he said was that they bred in the Tos Forests and descended lower down in the autumn. *Tos* is the silver fir which grows at an elevation of 8-10,000 feet.

In the winter cock come down to the alder, Koish (or *Kosh*) groves in the valley, and there they are shot easily. It is rare for one gun to bag 8 cock in a day in Kulu now.

J. COLDSTREAM, I.C.S.

KULU, 10*th February* 1911.

No. XXXII.—OCCURRENCE OF SWINHOE'S SNIPE (*GALLINAGO MEGALA*) AT MYITKYINA, UPPER BURMA.

The following note may be of interest as a record of *G. megala* within the area dealt with in the Fauna of British India. The specimen was one of three snipes shot here by a friend on 5th January 1911 and sent to the writer, who in examining them recognized this one as Swinhoe's Snipe.

The following notes were made at the time :—Length 11·75 inches ; wing 5·6 ; tail 2·27 ; bill 2·78 ; tarsus 1·35. Tail feathers 20, the eight median ones broad, six lateral ones on either side, much narrower but not nearly so narrow as the Pintail's. Iris chestnut. Legs and feet bluish plumbeous. Centre of abdomen white. Narrow white tips to primaries and secondaries. Distance between tip of shortest secondary and that of longest primary 2·6 inches.

F. E. W. VENNING, CAPT.

PYAWBE, BURMA,
August 1911.

No. XXXIII.—OCCURRENCE OF THE FANTAIL SNIPE (*GALLINAGO CŒLESTIS*) IN SIAM.

In the last number of the Journal, in the interesting account of the Common or Fantail Snipe, forming part of the series of "the Game Birds of India, Burma, and Ceylon," by Mr. E. C. Stuart Baker, I notice on p. 552 of the Journal, the following statement—"I have lately received a specimen from Siam whence it had not previously been recorded."

This statement shows how local knowledge may be left unrecorded for years, in this case probably, on account of its being such common knowledge. The fact is the occurrence of the Fantail Snipe in Siam must be known to practically every sportsman who shoots there and there are a good number especially in Bangkok.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

During a three years' sojourn in Siam between the years 1901-04 I kept a fairly accurate account of my bags, which I herewith append. I fear I did not in every case distinguish between Fantail and Pintail, but certainly on sufficient occasions to show that the Fantail is by no means a rare bird in Siam.

Here is the record taken from my game book:—

				Locality.	
Dec. 9th	1901.	3 Fantail Snipe,	1 Painted Snipe,	Augtuug,	Siam.
,, 11th	,,	2 ,,	..	Parudan	,,
,, 18th	,,	2 ,,	..	Petronuloke	,,
,, 22nd	,,	8 ,,	1 Painted Snipe	,,	,,
,, 25th	,,	12 ,,	..	,,	,,
Feb. 22nd	1902.	1 ,,	..	Prompiram	,,
March 24th	,,	9 Fantail and Pintail Snipe,		Sawankoloke	,,
Sept. 14th	,,	7 Pintail Snipe,		Bangkok	,,
,, 20th	,,	5 ,,		,,	,,
,, 21st	,,	16 ,,		Bangsue	,,
,, 27th	,,	23 ,,		Bangkok	,,
,, 28th	,,	70 ,,		,,	,,
Oct. 4th	,,	6 ,,		,,	
,, 5th	,,	50 ,,	and 11 Fantail,	Bangsue	,,
,, 10th	,,	41 ,,	and Fantail	,,	,,
,, 11th	,,	10 ,,		Bangkok	,,
,, 26th	,,	27 Snipe (mostly Fantail)		Bangsue	,,
Nov. 3rd	,,	20 ,, (only 5 Fantail)		,,	,,

The birds shot in December 1901 were obtained on my way up the Menam to Petronuloke where I was stationed for nine months, and do not represent any organized snipe shooting.

In and around Bangkok, especially at Bangsue, two or three stations up the line, the shooting is extremely good, and not exhausting work, the ground being chiefly paddy fields either cultivated or waste with only six inches of water or even less, so that one is seldom more than ankle-deep in mud and water. Snipe shooting in Bangkok commences about the second week of September when the Pintail begins to arrive, the Fantail not putting in an appearance until a month later. I note this agrees fairly well with the dates given on the two charts A and B included in the accounts of the two birds.

D. O. WITT, I.F.S.

SAUGOR, *17th May* 1911.

May I ask you to let me know to what species of snipe the enclosed wing and tail belong. They seem to me to be those of the Fantail snipe, but

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mr. E. C. Stuart Baker, in his article in the last number of the Journal, say only one specimen has been recorded from Siam. This bird was one of several of the same kind shot here on the 27th February last.

W. J. F. WILLIAMSON.

KINGSDON, BANGKOK, *5th March* 1911.

[The wings and tail sent were certainly those of the Fantailed Snipe (*Gallinago cœlestis*), but whether they belonged to the race *raddei* or not, it was impossible to say.—EDS.]

No. XXXIV.—SNIPE SHOOTING IN UPPER BURMA.

After reading Mr. Stuart Baker's article on Snipes in the January Number of the Journal, I should like to send you a few notes of my own on the movement of birds in the dry zone of Upper Burma.

In 1904 on Sept. 13th near Yindaw (Yamethin District) Major G. E. T. Green and I heard snipe crying overhead and looking up saw two snipes on the wing.

In 1905 I was in England.

In 1906 on Sept. 19th near Tangu (in the S. E. corner of the Myingyan District) when out quail shooting with Mr. F. B. Leach I heard a snipe cry, and saw a single snipe on the wing overhead out of shot.

In 1907-1908, 1909, I have no note owing to illness and absence. In 1910 on Aug. 16th at Allanmyo (near Thayetmyo) I heard a bird crying over-head and saw a single snipe on the wing. In none of these instances could I shoot or bring the bird to bag; but in each case my attention was caught by the unmistakable snipe cry before I saw the bird.

The first and last birds shot in each year, unfortunately I have not recorded. Fantails and Pintails were—

1906	Myingyan District	March 10th	Latest.
,,	,, ,,	Nov. 18th	Earliest.
1907	,, ,,	March 4th	(Latest, but I put up two probably Pintails, on a dry hillside on March 14th).
,,	Pegu District	Oct. 6th	Earliest.
1909	Myingyan District	Nov. 25th	Earliest.
1910	,, ,,	Feb. 25th	Latest.
,,	Thayetmyo District	Sept. 24th	Earliest.
1911	,, ,,	Feb. 20th	Latest.

With reference to Mr. Stuart Baker's query on p. 557 as to whether Snipe Shooting is harder in England than in India, I have the following notes on some snipes which I kept under observation in a small swamp in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Somersetshire in Dec. 1908. There was usually a wisp of 7 birds, which were abnormally wild and whether I had a gun or not, rose at 80 yards if I approached them over the frozen ground, but if I walked down over soft snow or in the ooze of a small stream that ran out of the swamp, I could usually get within 40 yards, whether with a gun or without. I came to the conclusion that the hard ground round this tiny swamp acted like the sides of the basin and transmitted the vibration waves across it. In Burma I have noticed, too, that snipe will be close for a barefooted native than for a shooting boot, and are far wilder for a shooting boot on a semi-solid kazin (or field-bund) than for the same boot in mud and water.

The English bird is the Fantail, which according to Mr. Stuart Baker (p. 592) has a more sensitive bill than a Pintail, so that this vibration theory might explain why the English bird is wilder and also why Pintails often lie so close when found among dry grass on solid ground. But it would also remain to be proved whether the Fantail normally rests with his bill in contact with the water.

I put forward the theory tentatively, and am prepared for destructive criticism from more experienced sportsmen.

E. N. BELL.

ALLANMYO, BURMA, *8th March* 1911.

No. XXXV.—THE OCCURRENCE OF A "BOOBY," *SULA CYANOPS* (?) AT CANNANORE.

My compound here ends abruptly in sea cliffs, and yesterday my servants killed a bird, which I take to be *Sula cyanops*, as it was sitting on the ground at the edge of the cliff. It was a young female, and the following is the description of it:—Length 31, wing 15·5, tail 7·5, tarsus 2·25, bill from gape 5·25.

Legs and feet, face to behind the eyes, chin and soft underparts of lower mandible, blue grey, nails of toes white. Bill bluish grey, paling to white at the tip and along the cutting edges, both mandibles feebly serrated, upper mandible longitudinally furrowed, irides pale lemon yellow.

Head, neck and upper back white with numerous small brown spots. Lower plumage, except the sides and thighs, which have a few brown spots, pure white, upper plumage from upper back, and the wing covert brown tipped and edged white, wings blackish brown, tail brown, secondaries and tertiaries brown, centred black and the basal portion white.

I shall be glad to know what *Sula* it is, for "Booby" it is, and Booby it was to have allowed itself to be hit over the head with a stick! I imagine it must have been driven there far out of its usual haunts by the heavy gales we have experienced lately, and although in splendid

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

condition and feather, exhaustion may have been the cause of its falling such an easy victim.

I have not seen any similar birds down in this part before, nor does Dewar mention the *Sula* among the birds of Madras.

H. R. BAKER, MAJOR.

CANNANORE, 20*th July* 1911.

[From the above description there appears to be no doubt that the bird is a masked booby, *Sula cyanops*. An example was caught at the new Docks, Bombay, in August 1909.—EDS.]

No. XXXVI.—THE OCCURRENCE OF *CYGNUS BEWICKI* AND OTHER SWANS IN INDIA.

During the cold weather of 1910-11, the exceptionally cold wave which occurred in Northern India during the months of November, December and January had the effect of sending us a large number of rare visitors amongst which Swans have been prominent.

No less than four of these—two beautiful skins and two heads—have been sent me from our Society, together with other rare birds, that I might have the pleasure of inspecting and noting on them. The most important and interesting of the swans is a beautiful female, correctly identified as *Cygnus bewicki* by Major P. C. Elliott-Lockhart, who shot it on the 30th December 1910 near Maidan on the North-West Frontier. He records the length as 3 ft. 9 in. and the weight as 12 lbs.

To these notes the following measurements should be added:—wing 20·0″, Bill, from top to cere along culmen 2·18″ and to edge of feathering 3·51″, along commissure to gape 3·32″; tarsus 3·32″.

Attention should here be drawn to the fact that Salvadori's measurement of the tarsus, 4·8″, as given by me on p. 14 of Vol. XI of the Journal, is a mistake for 3·8″. I do not think the tarsus of this little swan is ever much over 4·0″ if measured from joint to joint at the side.

A second specimen of *Cygnus bewicki* was obtained by Mr. Hornsby on the 2nd January; this is a magnificent male, and has a bill which upsets all previous theories as comparative measurements between this and other species of Swans.

The dates given on the ticket are "Tubi, Campbellpur." Measurements after skinning, expanse wing 77½″, length wing 21″, length 59″.

The bill of this bird measures no less than 4·2″ from tip to edge of feathering, a full 3″ longer than I have seen in any other spicimen of *bewicki*, but the colouring is very typical of that species. The lores and immediately adjacent parts seem to have been bright yellow when fresh, deepening to an orange yellow where this colour meets the black. This

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

latter extends over the whole of the bill in front of the nostrils and thence back on the culmen to within half of an inch of the cere and along the commissure up to the extreme gape. The bill in comparison with its length is decidedly slender, being only in depth at the base. The measurement of the wing now dried is 20·7″ and that of the tarsus from joint to joint 3·95″.

The two swans' heads sent by Major Magrath belong to very immature specimens of *Cygnus musicus*, both are undoubtedly birds hatched in 1910, and are practically still cygnets; for it must be remembered that swans take about three years to attain their full size. With the two heads Major Magrath sends the following notes.—"I send herewith the heads, bills and skins of the heads of two swans shot out of a small herd of seven by Mr. M. Donlea, Inspector, N. W. F. Police, on the 10th December, near Dheri Momim, on the Kabul River. The birds, one of which was shown me in the flesh were immature. The one I inspected had a greyish brown head and neck, the rest of the body being white and the legs black. *The culmen for more than half the way down the mandible* was of a bright pinkish hue and the base of the bill and *bare loreal space to within about half an inch of the nostrils was pale fleshy in colour.*" (The italics are mine.)

The measurements of the bills of these two cygnets are—from tip to edge of feathering 3·15″ and 3·17″ and from tip to eye 4·2″ and 4·4″; width at broadest part 1·24″ and 1·22″. In both these birds the pale colour of the bill extends down the top of the culmen well past the nostrils.

E. C. STUART BAKER,
F.L.S., F.Z.S., M.B.O.U.

No. XXXVII.—UNCOMMON BIRDS IN THE UNITED PROVINCES.

Common Sheldrake, *Tadorna cornuta*.—On January 22nd two common Sheldrakes were seen on a jheel close to the Ganges near Fatehgarh, and one was obtained some weeks later. On 20th February six were seen feeding on the edge of an open tank in the same district. According to *Indian Ducks and their Allies* this duck is only a rare visitant to Oudh.

Goosander, *Merganser castor*.—Two females of this duck were shot on 28th January close to Cawnpore on a jheel which was dry except for three or four small pools of water. I have seen these birds feeding at the mouths of rivers in North China but never in shallow stagnant water. No one in my Regiment had ever seen one anywhere before in India.

Great Indian Bustard, *Eupodotis edwardsi*.—Three birds of this species were seen near Orai in the Jalaun district, but none of them were obtained. They were feeding close to a herd of Blackbuck and in the distance we took them for buck, as they showed up black and white.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A Goose was obtained out of a large gaggle near Handoi. It was practically black with a speckled breast, small in size, but bigger than and essentially different from a Sukta. No one was able to name it.

M. A. GUDLESTONE, CAPTAIN,
41ST DOGRAS.

CAWNPORE, 10*th April* 1911.

No. XXXVIII.—NIDIFICATION OF THE LITTLE GREBE OR DABCHICK (*PODICEPS ALBIPENNIS*).

For the past two years I have been watching several birds of the above species on the marshy ponds between Grant Road and Mahalakshmi stations of the B. B. & C. I. Railway, particularly with regard to their breeding habits as they appeared to be building all through the year.

From the several books I have on Ornithology it appears that ordinarily May to September are the months in which nests should be found ; but I have taken three nests outside these months at very wide dates. Hume says it breeds at very different seasons according to locality. The earliest dates I find recorded are in Hume's "Nests and Eggs of Indian Birds" in which Mr. W. Theobald remarks : "Lays in the second week of May"—this was in the valley of Cashmere. In the same work Mr. Davison says it breeds on the Ootacamund Lake in May. The latest date recorded is by Mr. H. Wenden who, on 26th October at Goolburga Fort, found a nest containing five eggs.

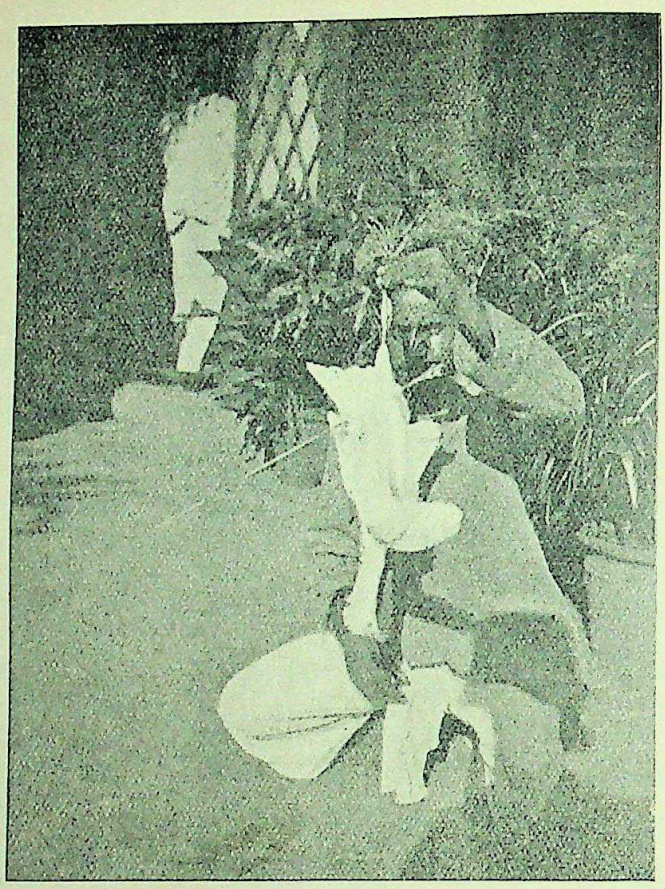
I took a nest with five eggs on the 31st March, two of which had not been long laid, as they were lighter than the others which were the usual smoky brown. I took another on the 16th November containing four very fresh eggs, the last of which could only have been laid just prior to my taking the nest as it was white with a faint bluish-green tinge. But to my surprise I noticed a pair of birds building in December last, and decided I would wait till the last day of the month before I took the nest which I did, and found three much incubated eggs. The nests were of the usual kind—no construction—merely masses of decomposed weeds apparently resting or attached to some water-grass, and had a very offensive odour. Hume says : "I doubt whether the birds sit much during the day....." I almost invariably found the old bird sitting, and when approaching the nest it was interesting to watch the bird cover up the eggs with that marvellous dexterity, for which the species of this genus are noted, and then quietly slip away and disappear into the water, but as I once noticed, watched what my coolie was doing with its head just above the surface as a snake's would be.

JOHN FRY.

MAHIM BOMBAY, 11*th April* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



No. XXXIX.—RECOVERY OF BIRDS FROM INJURIES.

On 31st December 1909 while snipe shooting, with a friend, I noticed a Cattle Egret (*Bubulcus coromandus*) sitting alone on the edge of a swamp. Other egrets were sitting and moving about, but at a little distance from this one which appeared to have a stick protruding from its back. Immediately I moved towards the bird, it flew away and its appearance with a mast erect between its wings was quaint. Thinking the bird must be suffering, I called to my companion to shoot the bird which he did.

The Karens use cross-bows a great deal and some attain a marvellous degree of accuracy with them. This bird, however, was in all probability shot by a fluke while flying. The arrow was of the usual type used for shooting at birds and small mammals—bamboo with hardened point. It was some 20′ in length; had penetrated and passed through the abdomen, its exit being through the sacrum a little above the ischiatic foramina. About 16″ of the arrow had passed through the body, we found that the bird must have

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

received the wound long time previously, as it had healed perfectly, the arrow was more or less firmly fixed; we took the bird to Rangoon to show to persons interested and to have a photograph taken, after which we plucked it and found the bird in good condition; the plumage was clean and bright.

In this connection it is quite astonishing how birds do recover from injuries I had a tame Koel (*Eudynamis honorata*). One night a cat managed to break into the cage, fortunately the bird made such a noise that a servant came and rescued it, but not before it had received severe injuries. When I saw it I wished to destroy it; but the servants implored me to give it a chance, and they would treat it. The bird recovered. It is interesting to examine bags of snipe, as one often meets with extraordinary cases of recovery from fractures, caused by shot, of the femur, tibio-torsal bone, etc.

G. H. EVANS, LT.-COL.

LAHORE, 18th April 1911.

XL.—HABITS OF THE PYTHON *(PYTHON MOLURUS)*.

In "Forest Life and Sport in India"—(Eardly-Wilmot)—as to the attack of the Python on its prey, the Author writes:—"It may therefore well be the "case that the blow of a heavy python would be sufficient to stun a passing "deer until it could be enfolded in the grip of the snake, and that this "method of hunting may supplement the sudden and more deadly attack "from overhead."

In reference to these remarks, the following notes are interesting. A few years ago on one of my many visits to Jamrach's collecting Depot, in Entally, Calcutta, Scott, the Manager, showed me with great pride, an enormous python in a box, length between 21 and 22 feet. I asked Scott how such a huge brute was captured? He told me that two of his collectors were in the Khasyia Hills looking out for captives. One of the men when high up in a tree making his way to a nest happened to look down and saw this python hanging from a branch, slowly swinging with its head a few feet from the ground. The man said he was very frightened and made not a move. All at once the python became rigid; by and by the bird-nester heard the rustle of leaves not far off and recognized that it was the foot-path of his fellow collector, by whistling he was able to signal to him to give the tree a wide berth. Soon the snake began swinging very slowly, then it again became rigid, and the light patter of a deer was heard and a barking deer came in view and within striking range of the python "when like a shot it was sent flying:" and there it lay almost motionless. In a little the python got down to the ground and glided over to, and lay on, the deer. In a short time the operation of swallowing began. During the process of swallowing, the two men made a basket, and when the snake had resigned itself to rest, the basket was worked over it and the making of it completed;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

over this another basket was made, and in the double basket it reached Calcutta. The men said they had no trouble in getting it into the basket.

W. FORSYTH.

PEN ITHON HALL, NEWTON, N. WALES,
15th June 1911.

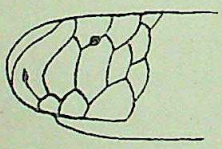
No. XLI.—REMARKS ON TWO RARE BLIND SNAKES.

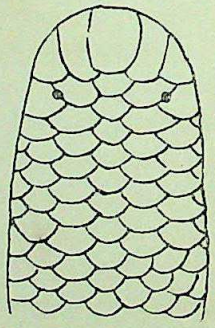
In examining the blind snakes (*Typhlopidæ*) in our Society Museum, I have come across two that are worthy of remark.

T. porrectus. (Stoliczka.)

There is a single specimen of this species from Poona, which does not quite accord with Jan's figures of the type. Further Boulenger's description (Cat., Vol. 1, p. 19), judging from this specimen would bear amplification.

I would describe it as follows :—*Rostral.*—Not reaching level of eyes. *Nasal.*—Not meeting behind rostral; semi-divided, the suture passing to the 2nd labial. Head covered with shields slightly larger than those on the body. Of those there are 8 in the median line, 9 on either side, the anterior 2 of the latter (the *supraocular* and *parietal*) being rather broader than the succeeding 5. (Jan shows 4 median and 3 lateral shields enlarged). *Præocular* touching 2nd and 3rd labials; subequal to ocular. *Ocular* touching the 3rd and 4th labials. *Temporal* one (Jan shows three). *Costal* 17. (not including the ventral row) in whole body-length. Snout rounded. Eye black and very distinct (Boulenger indistinct), small, lying beneath the suture between the supraocular and ocular shields. Length 133 mm. Breadth 1/58 the total length (Boulenger 1/70 to 1/90). I append figures.





T. mackinnoni (Wall.)

This species has been till now known only from a single specimen collected in Mussoorie, now in the British Museum. In our Society's collection I find one labelled *porrectus* with no record of locality. It differs from the type in that the rostral does not quite reach the level of the eyes. In length it is 185 mm. The literal breadth is 1/46, the total length, agreeing

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in this as in other respects with the type. The costals are 17 (not including the ventral row) in the whole body-length, not 19 as stated in error in the original description (Bomb. N. H. Journal, Vol. XIX. p. 805).

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 13*th March* 1911.

No. XLII.—ON THE OCCURRENCE OF THE SNAKE *DIPSADOMORPHUS NUCHALIS* (BEDDOME) IN BERHAMPUR ORISSA.

In the records of the Indian Museum (Vol. III, pp. 151, *et seq.*) I remarked upon certain forms of *Dipsadomorphus* hitherto included under the name *D. ceylonensis*, four of which combined certain characters, making it appear that each form deserved recognition as a distinct species.

One of these forms, *viz.*, *nuchalis* (Beddome) I showed by a series of 16 specimens combined the following characters:—(1) scales 21 (rarely 23) in midbody, (2) 234 to 251 ventrals, (3) 90 to 108 sub-caudals, (4) Habitat—Hills in Western India and Nepal.

I have recently had a specimen in complete accord with this type from Berhampore (Orissa), which is specially interesting, because it links up the previously known curiously distant habitats. The specimen has 21 scale rows in midbody, 244 ventrals, and 108 sub-caudals. The vertebral scales are nearly as broad as long. The colour is a darkish grey, and there are obscure blackish oblique bars costally.

It is still further interesting in tending to support my views, which Dr. Annandale attacked in the succeeding number of the Journal above referred to.

As far as I am aware, none of the forms I referred to have been reported from Hills on the Eastern side of India, so that, whether these forms will eventually be recognised as varieties of one species or species distinct from one another, it is interesting to know that one form at least inhabits the Eastern side of Peninsula India. I think it a safe assumption that the specimen I have just acquired is a wanderer from the adjacent Hills which are but 8 or 10 miles distant.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 6*th April* 1911.

No. XLIII.—IS *LYCODON GAMMIEI* (BLANFORD) AN ABERRANT SPECIMEN OF *LYCODON FASCIATUS* (ANDERSON)?

I was much interested to see in the last Journal (p. 855) the snake *Lycodon fasciatus* recorded from exactly the same locality in the Eastern Himalayas, in which *Lycodon gammiei* was collected, especially as I have

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

for a long time thought the latter would prove to be an aberrant example of the former.

The type and only specimen of *gammiei* is in the Indian Museum, and when I examined it some years back, I remarked on the great similarity in colour and lepidosis between it and *fasciatus*, and was inclined to think the two would probably have to be united. I was deterred from voicing this opinion firstly, because *fasciatus* had never been recorded from the Eastern Himalayas, and secondly, on account of scale differences. Now that the first objection to my opinion has been removed, it is worth enumerating the scale differences noted.

(1) First there is the fact that there are in *gammiei* 19 scales in midbody whereas in *fasciatus* there are 17. (2) The ventrals and sub-caudals in *gammiei* are in excess of the ranges given by Mr. Boulenger (Cat. Vol. I, p. 358) for *fasciatus*. (3) The loreal in *gammiei* fails to touch the eye, but in *fasciatus* it usually does so.

To take the scale rows in *fasciatus*, they are 17 shortly behind the neck, and remain so to well behind the middle of the body, then reducing to 15. In *gammiei* they are 17 for about 6 headslengths behind the head, then become 19 by a division of the 3rd row above the ventrals, and remain 19 till behind the middle of the body where they reduce to 17 and subsequently to 15. Now it is no unusual thing to find individuals in many species that exhibit the same anomaly (as I believe this is) ; the scale rows for a variable length in the body exceeding the normal by two. I have seen this in more than one species of *Dipsadomorphus*, *Oligodon* and *Simotes* in *Silybura ocellata Ancistrodon himalayanus* and other snakes. The peculiarity of the scales in *gammiei* need not therefore deter one from considering it an aberrant *fasciatus*.

As regards ventrals and subcaudals, Mr. D'Abreu reports the counts in his specimen as 214+98, thus according well with those in the type of *gammiei*, which Blanford recorded as 214+101. (I however make them 222+100).

With reference to the third point, Mr. D'Abreu mentions that the loreal is pointed behind (he says anteriorly, but obviously means posteriorly), but does not reach the eye. This is the exact condition in the type of *gammiei*.

I examined the type of *gammiei* beside specimens of *fasciatus*, and in every detail except those referred to above, the two forms seemed to agree. The colouration is exactly as in *fasciatus*. I feel very confident now that *gammiei* is an aberrant example of *fasciatus*, and as it was described first, the species should in future be known as *gammiei*, Anderson's name *fasciatus* being suppressed.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 1*st March* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XLIV—DO SNAKES SWALLOW STONES ?

The other day, while examining the insides of a large *Tropidonotus piscator*, I found a solid piece of mortar, measuring about an inch by three-quarters and half an inch in thickness. It would appear that snakes like crocodiles and birds swallow stones to aid their digestion. I would like to know if other members have noticed similar incidents.

E. A. D'ABREU, F.Z.S.

NAGPUR, C. P., *27th August* 1911.

No. XLV.—REMARKS ON THE GREATER, AND LESSER BLACK KRAITS (*BUNGARUS NIGER*, AND *B. LIVIDUS*).

Having just received two specimens of that uncommon and local Krait *B. lividus* from Mr. D. A. Jacob, I.F.S., from Jalpaiguri District, I think some remarks on this species and its near ally *B. niger* may be of interest. The lesser black Krait (*lividus*) was described originally from Assam by Dr. Cantor in 1839, but its validity as a species was doubted and Dr. Gunther in 1864 merely conceded to it the rank of a variety of our common Krait (*cæruleus*). Later, however, in 1890 Mr. Boulenger restored to it its lost dignity as a species, and I think most herpetologists will agree with his view.

Until last year it was confused with another very similar Krait which I described in this Journal* as a distinct species under the name *B. niger*.

The two, though inhabiting the same restricted area, are easily known from one another by the development of the vertebral row and the ranges of their respective ventral and subcaudal shields.

In *lividus* the breadth of the vertebrals does not exceed their length, and in this it differs from all the other Kraits up to date described. Those shields *appear* longer than broad, but if accurate measurements are taken they will be found usually to be as broad as long. I believe it is a decidedly smaller snake than *niger*. It is poorly represented in our Museums, there being but four in the British Museum; none in either the Indian Museum nor our Society's Collection.

Both snakes are uniformly black dorsally, with a greyish or bluish sheen in certain lights. In the young of both there is no præocular white spot, nor blotches of white on the occiput as is usual, if not always the case, in the common Krait (*cæruleus*). The belly is alike in both being white for a variable length in front, later becoming mottled with dark plumbeous especially in the bases of the ventral and subcaudal shields.

I have now examined 12 specimens of *lividus*, and the details of these are shown in tabular form for easy reference, and comparison with 19 specimens of *niger* I have examined.

---

* Vol. XIX, p. 838.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I have the jaws of the largest specimen referred to and a complete skull of a Jalpaiguri specimen, and the dentition shows fewer teeth in the mandibles than in *niger*, of which I have five skulls. In both species there are three small grooved teeth in the maxillar behind the pair of fangs. In *lividus* the palatine teeth are 9, pterygoid 7 to 9 and the mandibular 12. In *niger* the palatine are 9 to 13, pterygoid 8 to 11, and mandibular 15 to 18.

I could gain no information in Assam about the poisonous effects of the bite of *niger*, but was more fortunate in obtaining information about *lividus*. A planter near Tezpur had a cooly woman bitten by one, and she died some 12 to 18 hours later. The specimen was killed and kept, and submitted to me for identification. It measured 3 feet 2 inches, and was much the largest I have seen. No medical details of this case were kept unfortunately.

BUNGARUS LIVIDUS.

	Length.	Ventrals.	Subcaudals.	Total Vent. and Subc.	Habitat.
1	....	215	37	252	Assam. In Brit. Mus.
2	....	214	38	252	Do. do.
3	....	212	36	248	Do. do.
4	....	212	42	254	? do.
5	3′ 2″	215	37	252	Madopu. near Tezpur Assam.
6	1′ 6″	209	37	246	? In St. Joseph's College, Darjeeling.
7	2′ 0″	212	36	248	Tindharia, E. Himalayas.
8	1′ 6″	212	38	250	Do.
9	1′ 1¾″	211	35	246	Do.
10	1′ 1¼″	212	39	251	Jalpaiguri District.
11	1′ 10¾″	217	40	257	Do.
12	1′ 6″	215	41	256	Do.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BUNGARUS NIGER.

	Length.	Ventrals.	Subcaudals.	Total Vent. and Subc.	Habitat.
1	....	224	50	274	Garo Hills, in Indian Museum.
2	....	231	47	278	Sibsagar, Assam. In Indian Museum.
3	2′ 9″	225	53	278	Dibrugarh, Assam.
4	3′ 4¾″	229	54	283	Do.
5	2′ 5″	224	52	276	Do.
6	4′ 0½″	216	51	267	Do.
7	3′ 3¼″	223	53	276	Do.
8	3′ 10¾″	221	55	276	Do.
9	3′ 8″	222	51	273	Do.
10	4′ 0″	?	?	?	Pashok, E. Himalayas.
11	1′ 2″	221	51	272	Do.
12	3′ 6½″	225	48 ?	273	Do.
13	....	224	55	281	Do.
14	4′ 0″	231	57	288	Pashok or Tindharia, E. Himalayas.
15	1′ 3¼″	224	57	281	Do. do.
16	3′ 5½″	225	57	282	Tindharia, E. Himalayas.
17	....	223	54	277	Do.
18	....	225	56	281	Do.
19	....	226	53	279	Namsang, near Jaipur, Assam.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 16*th June* 1911.

No. XLVI.—LARGE COMMON AND BANDED KRAITS.

I send herewith the measurements of what I think must be a record Krait, variety, *Bungarus cœruleus*; it was killed at Hazaribagh last year by Major F. Stevens, I.M.S., the Civil Surgeon, who kindly sent it over to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

me on June 1st, 1910. I think this is worthy of publication in the Journal. Length 4 ft. 6¾ inches ; tail 7½ inches ; scale rows 15 ; ventral scales 215 ; sub-caudals (entire) 50 ; anal entire ; sex male ; weight a little over 12 oz. First complete double white ring (or bars) commences about 11 inches from snout. Length of claspers about half an inch each. Colour ordinary plumbaceous madder brown, white of vent slightly yellowish.

Mr. Hayes, a Mine Manager, killed a Banded Krait (*Bungarus fasciatus*) a little while ago some miles from Koderma, E. I. Ry., which measured 7 ft. in length.

O. A. SMITH, MAJOR, 27th PUNJABIS.

KODERMA, E. I. RY., 19*th July* 1911.

No. XLVII.—THE DEVELOPMENT OF EMBRYO IN THE EGGS OF THE OVIPAROUS VIPER, *LACHESIS MONTICOLA*, PRIOR TO OVIPOSITION.

I am sending you some eggs I removed from a gravid *Lachesis monticola* that was killed in Shillong in July this year. They are specially interesting, because they contain as you will see embryos.

The fact that this viper is oviparous has been known since 1904 when our Society received deposited eggs containing embryos about six inches in length from Mr. G. A. Millar, St. Joseph College, from Kurseong. The observation has been confirmed by the Revd. C. Leigh who wrote a most interesting article on this snake in the *Field* (1st January 1910). He mentions therein two clutches of deposited eggs, but though he adds three records of eggs removed from gravid parents after death, he does not allude to any of these containing embryos.

The parent snake in my case measured 2 feet 2 inches. She contained 7 eggs, 4 in one ovary, and 3 in the other. These eggs were flattened where the poles met in opposition, and measured about $1\frac{3}{8} \times \frac{7}{8}$ inches. When cut open I found an embryo coiled up in a chamber at the side of the yolk lying just beneath the ovicular membrane. The head was distinctly observed with a large boss at the back (primary cerebral vesicle). The eye is distinct, the upper jaw slightly beaked, and the mandibles much shorther than the latter, and not joined symphysially. The heart is distinct, and the whole fœtus measures a shade over one inch unravelled. How much longer these eggs would have been retained it is impossible to conjecture, but it is probable that the embryos may grow larger before the eggs are ripe for discharge.

The condition of the egg and embryo is exactly that recorded by me in this Journal with regard to the snakes *Typhlops diardi*, *Dendrelophis tristis*, and *Dendrophis proarchos*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I think it is a pity the word ovoviviparous is not used exclusively to denote this type of egg, retaining the word viviparous for fætal birth, and oviparous for eggs with no trace of Embryos.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, *7th August* 1911.

No. XLVIII.—A SPORTING KASHMIR FISH, THE CHEROO—*SCHIZOTHORAX ESOCINUS.*

Of the fishes native to Kashmir which remain with us throughout the year I think this fish must take the premier place. Among European visitors to the Valley it is known as "Cheroo," but the more discriminating gar hanjee gives this name only to the male fish, the female being known to him as the "paket gar." The scientific name indicates predatory habits and as with many other predatory creatures such as hawks, eagles, spiders, etc., the females of this species greatly exceed the males in size and strength. One season at Ganderbhul, where the Sind river debouches from the hills into the Kashmir valley, I heard of two hen "cheroo" of over 20 lbs. being taken with the rod (both full of ripe ova) but I have never heard of a cock fish being caught over 6 or 7 lbs. weight. The spawning season is from March to June and it is only at this time of the year that "cheroo" are to be found out of the lakes and sluggish waters of the Jhelum. Even then they rarely ascend very far into the more rapid waters of the hill stream but take advantage of the first covenient gravel beds to deposit their ova. The egg is about one-fifth or sixth the size of a trout egg and roughly I should guess the deposit of a hen fish of 20 lbs. weight to be over 100,000 ova. Formerly many more "cheroo" fell to the rod and line in Kashmir than is the case to-day and as a rule those now caught are taken in the spawning season when they give little or no fight. Even a big fish foul-hooked is little more than a log when full of ova and the sport does not attract one. In the autumn however it is different. *Esocinus* is in top condition in November-December and those who have caught it then spinning or with a piece of duck's liver or a frog for a bait can tell of good fights put up and of very palatable additions to the cuisine. The long pikey head and spotted body are the most striking characteristics of the fish ; it can usually be recognised by these but for more exact identification I give the following description from Day's *Fishes of India*:—

"Fin rays D 12 (4/8) P. 20, V. 10, A. 7, (2/5) C. 20.

"Length of head 4¼ to 4½ in total length. *Eyes*. Diameter 6½ in length of head, 2 diameters from the end of the snout and also apart. The upper jaw the longer; the maxilla reaches to nearly below the front edge of the eye. Lower labial fold interrupted in the middle. A horny covering to inside of the lower jaw. *Barbels*.—The rostral more than half longer than the eye, the maxillary a little

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

shorter.—*Fins.*—The dorsal as high as the body, commencing slightly nearer to the base of the caudal than to the end of the snout. The pectoral does not quite reach the ventral; the latter which arises beneath the second or third undivided dorsal ray extends two-thirds of the distance to the anal. Length of base of anal about three-sevenths (3/7ths) of its height, when laid flat the anal reaches the caudal which is deeply forked. Free portion of the tail as high at its base as it is long.

Colour.—Silvery with numerous black spots most distinct in the upper half of the body.

Habitat.—Leh or Ladak and headquarters of the Indus, also Kashmir and Afghanistan."

My sporting experience of the fish is limited. On a hot summer day I have watched small ones of from 5″ to 10″ sailing round in a clear spring-fed pool where their every movement could be watched and have played a small hackle fly on the finest of tackle over them. Presently a fish detaches itself from the shoal and comes up with a rush, a quick strike and it is either jerked out of the water away from its companions or has missed the fly altogether. In the former case a little play intervenes before the game begins again, to be continued till 4 or 5 of the little fish have been taken out. If the strike is not made at exactly the right moment, the fly is seized and dropped with such wonderful rapidity that one would be inclined to believe it had never been touched. The shoal does not appear to be in the least alarmed by the loss of its members, and it is more the absence of more flytakers than alarm that limits the catch.

Some years ago great sport might sometimes be had from house-boats in Srinagar on an autumn evening after sunset. I can well remember one or more merry parties on board a house-boat festooned with ducks from the great Holkarsar jheel. One or two rods were generally in keen hands and the excitement when a reel spoke was intense. Before dinner time 3 to 6 good fish were often got safely on board and the delight of a young girl of 13 or 14 when a grand "cheroo," which had been fighting hard on her rod for 5 minutes, was netted turning the scale at 4½ lbs. will not easily be forgotten.

F. J. MITCHELL.

KASHMIR.

No. XLIX.—NOTE ON DISTRIBUTION OF *LETHE KANSA*, (MOORE) AND *DOPHLA PATALA*, KOLLAR.

Lethe kansa.—Mr. de Rhé Philipe's note on this species at p. 755, Vol. XX of the Journal, is not quite accurate.

I had already recorded it as "common in Cheena, Naini Tal, at 8,000 feet and less, so at Nalena, 4,500 feet in April and May," Vol. XX, p. 134.

Its range in Sikkim too is given in Moore's Lep. Indica, Vol. I, p. 241, on the authority of Elwes as "up to 9,000 feet."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Its range in altitude and area is therefore a good deal more extended than Mr. Philipe supposes.

Dophla patala.—Mr. de Rhé Philipe's puzzle as to distribution can be readily solved by noting the distribution of its food-plant or plants. In Kumaun, to the best of my belief, it confines itself to *Quercus incana* and *Q. dilatata*. Mr. Osmaston informs me that neither of these oaks is to be found East of Nepal.

The oaks of Sikkim are:—*Q. pachyphylla*, *Q. lamellosa*, *Q. lineata*, *Q. genestrata* and *Q. spicata*, and apparently none of these suits its fastidious taste. It would be interesting to know whether the food-plant of *Dophla taoonana* is an oak in Burma more nearly allied to *Q. incana* than to any of the Sikkim species, that *Dophla taoonana* and *D. patala* are synonymous Mr. Philipe's note seems to leave no doubt.

F. HANNYNGTON.

CALCUTTA, 21st *May* 1911.

No. L.—APPEAL FOR INFORMATION CONCERNING *PAPILIO POLYTES*.

This butterfly is mentioned by Bingham (Faun. Brit. Ind. Butterflies, Vol. II, p. 61) as being dimorphic through most of its range, and trimorphic in the south of India and Ceylon. A search through entomological literature has failed to produce more than one or two precise references to the number of forms of female found in any district, though the butterfly is usually common, and must often come under the notice of Indian entomologists. Further in relation to the fact that the *polytes* and *romulus* females of the species "mimic" *Papilio aristolochiæ* and *Papilio hector* respectively, it would be of great interest to learn to what extent the mimics and models occur together. I should be exceedingly grateful for any information, however slight, on these points, and in addition I may perhaps be allowed to mention, that ova or larvæ of *P. polytes* would be very welcome, especially from a locality where only two forms of female occur. I have recently undertaken some breeding experiments in relation to the inheritance of the various forms and material from a fresh locality is exceedingly valuable.

J. C. F. FRYER.

THE ROYAL BOTANIC GARDENS,
PERADENIYE, CEYLON, *July* 1911.

No. LI.—A NOTE ON *POLYOMMATUS BŒTICUS*.

De Niceville in his "Butterflies of India, Burmah and Ceylon," Vol. III., quotes no less than three distinct descriptions of the larva of *Polyommatus*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bœticus and himself gives a fourth. The larva as met with in the Hyderabad district of Sind differs from all four and is as follows: Head shining black; spiracles dark brown; ground colour a dirty flesh colour or crimson with the following darker crimson markings:—a mid-dorsal line, below this on either side a series of oblique streaks, one to each segment, running backwards and outwards to meet a sub-dorsal line, a third line just below the spiracles. The whole body is covered thickly with short, stiff black bristles but on the eleventh segment, in the usual situation for the two pillar-like processes from which the tentacles are thrust forth, are two bald patches. In some specimens, I examined, these two areas were covered with a scanty covering of bristles shorter than those clothing the rest of the body and what was still more interesting, in one particular specimen, whereas one area (the right) presented immature bristles, the other was entirely bare. The pillar-like processes were absent in all specimens examined but the mouth like opening situated in the middle of the posterior part of the segment was always present. The larvæ as one might expect from this description, were unattended by ants. I attempted to persuade the larva to secrete the sweet liquid so much appreciated by ants, by means of tickling them with a camel-hair brush but no amount of irritation had any effect, and I conjecture the mouth-like organ is functionless. The larva met with in other parts of India has the pillar-like processes well-developed and is always attended by ants. Referring again to De Niceville I see in his preface to the *Lycaenidae* that he mentions that these organs were first described by M. Guenèe in 1867 from a specimen of *P. bœticus* and in his description of the insect observes that no less than three species attend it. The habits of the Sindh form fully explain why these organs should have degenerated, for degenerated they clearly have, the two bald areas representing the sole vestiges of the organs.

The larvæ I examined are winter forms, a period of the year when ants are more or less dormant in Sindh. The young larvæ as soon as they hatch out, eat their way into the bud on which the ovum has been deposited and then close the hole of entrance with fine web, and also prevent the bud from opening, with other strands which bind the leaves together. The larvæ are thus fairly easy to find by noticing in any panicle of bloom whether any bud has remained unopened. Examination of such a bud usually results in finding the owner at home. Thus not only are possible foes excluded but also the friendly ant, who would find it quite impossible to enter the bud in order to milk the larva. It is significant that two other larvæ, those of *Aphnaeus hypogyrus* and *Tarucus theophrastus* belonging to the same family and which are invariably attended by ants do not breed in this same district, during the winter months, probably because there are no ants in the cold season to care for them. It is to be conjectured that

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

P. bœticus finding the ants had forsaken it, adopted the new protective device of sealing itself in the food-buds and that later the pillar-like processes atrophied from continued disuse.

F. C. FRASER, CAPT., I.M.S.

HYDERABAD, SIND, *February* 1911.

No. LII.—SOME DISPUTED POINTS IN THE ANATOMY OF A COMMON INDIAN EARTHWORM.

In recent years it has become the custom for junior students of medicine in India to practise the dissection of various animals. It is hoped that by so doing they will foster a spirit of inquiry which perhaps lies dormant at present. It is necessary that the student should have some written guide to help him in such work, and it is essential that this guide should be accurate so far as it goes, it should not invite the student to see things which have no objective existence. I found it necessary to write such a guide for the use of my students in Calcutta. Dr. A. Powell had previously written a similar book mainly for the use of students in Bombay; this book was unknown to me until my own was in the press.

Among other animals a common species of earthworm, *Pheretima posthuma*, was chosen by us both as a type for dissection. Although I did not consult Dr. Powell's description, I received help from an earlier account of the anatomy of this species, which was written by E. Perrier. (N. Arch. Mus. Paris, Vol. VII.)

In reviewing my book for this Society's Journal, Dr. Powell points out certain discrepancies between our respective accounts of the structure of *Pheretima*, assuming, naturally enough, that my account is inaccurate. I do not, however, agree with him on the whole.

The disputed points are as follows:—

1. The distribution of the dorsal pores. Are they to be found in every segment?
2. The nature of the male generative duct. Is it a single or a double tube on either side?
3. The nature of those organs which I have called œsophageal glands. Are they excretory organs or have they some other function.

These points may be discussed in order?

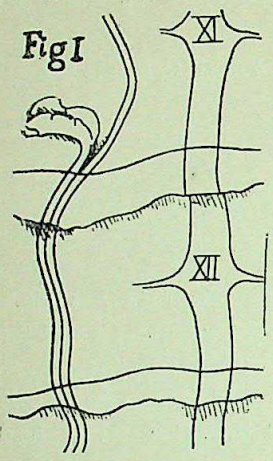
In regard to the dorsal pores, Dr. Powell is quite right. I had overlooked the fact that they were not present in the first twelve segments.

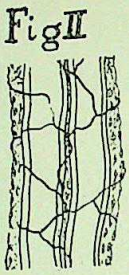
In regard to the structure of the male generative ducts, I find that I am right. If one of these tubes be excised and examined under the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

microscope, it will be seen to be double in its whole length. Fig. 1 shows the appearance presented by an actual dissection, stained and mounted, and examined under the low power of the microscope. Fig. 2 shows a portion of the duct as it is passing through the fifteenth segment, examined under the high power. Both drawings were made with the help of the camera lucida. Dr. Powell describes this duct as single. It may be that we have been describing different species, or it may be that he has trusted too much to unaided vision.





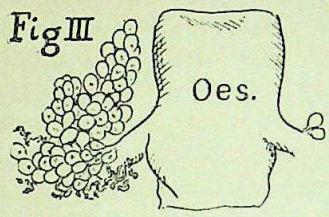
In the above mentioned points, the basis of disagreement is clear: Dr. Powell has described certain structures as being such and such, while I have described them otherwise; but in the third matter for discussion, the nature of the glands which I have called œsophageal, we stray away from matters of fact. Since Dr. Powell has not given any description of the glands in question, I cannot compare my description with his. There are certain large glands in the fifth segment which were, I think, first described by Perrier. Dr. Powell has not mentioned their form, which is exactly like that of a bunch of grapes in miniature; nor their colour, which is red; nor their large duct, which opens into the œsophagus on either side. These structures are glands with a duct opening into the œsophagus; this is plain, hence I spoke of them as the œsophageal glands. I was unwilling to call them nephric or peptic, or even pepto-nephric, since their function is unknown. Dr. Powell will surely admit that anyone guessing the function of a glandular organ might make a mistake, unless he was guided by some evidence.

He writes in the review "we do not quite appreciate what he describes as the 'œsophageal glands.'" The verb 'to appreciate' is used in various senses; we cannot, therefore, be quite sure of Dr. Powell's opinion concerning these glands, which he does not quite appreciate. Is he of the opinion that they do not exist as described by Perrier or does he object to my agnostiscism in regard to their function. It is not certain that Dr. Powell has seen the glands in question, for perhaps we have been dealing with different species, yet he is referring to my description of them when he says—"These organs are undoubtedly nephridia." The excretory organs known as nephridia in earthworms are minute whitish tubes; how then can organs which resemble red grapes be nephridia? But Dr. Powell says "undoubtedly" they are nephridia. We may, therefore, suspect that some

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Zoologist of European reputation has said that they are nephridia; at the word of authority, red appears as white and avoid objects seem tubular; but how about the perplexed student, who in Bombay, no less than in Calcutta, is urged to see things as they are?



In Fig. III is shown an outline drawing of a part of an œsophageal gland. The size of the ducts in its relation to the size of the œsophagus was laid down from the object with the help of the camera lucida, it is not exaggerated. Let it be admitted at once, both by Dr. Powell and myself, that neither of us know the nature of the substance which pours down these ducts into the œsophagus; but as the ducts are so large, we may be sure that the function is important. Dr. Powell believes presumably that the substance is some kind of excreta. But what happens to it on entering the œsophagus,—does it return to the blood in a vicious cycle, does it travel unabsorbed through the whole length of the intestine, or does the worm retch and throw it out of the mouth? Considerations such as these prevent me from teaching my students that these organs are excretory in function, quite apart from the fact that their actual function is unknown. I do not deny that nephridial tubes open into the œsophagus; for it is easy to see that many of them open into the ducts of the œsophageal glands; but I still persist in regarding the œsophageal glands as distinct, anatomically—and most probably physiologically—from the excretory organs.

Dr. Powell objects to the term used because "the name œsophageal glands has already been given to well recognised structures of totally different homology." It is probable that by throwing together the synonymous terms calciferous glands and œsophageal pouches, which are both well known, he has come to the erroneous conclusion that the non-committal term œsophageal glands has been used for something else. I am quite unable to say whether these glands are homologous with the well known pouches of the European worm; indeed, it seems that the word homology has recently lost much of its meaning. If, as many think, we must give up our dreams of one organ gradually fading into another—for example, of a nephric organ becoming half peptic, half nephric and finally wholly peptic—so, accordingly, we must hesitate in using the word homologous.

R. E. LLOYD, CAPT., I.M.S.

CALCUTTA.

Capt. Lloyd's text-book says of the *vasa deferentia* in *Pheretima* (Perichæta) *posthuma*, "the two ducts of a side come in contact in the 12th

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"segment, but do not unite, they pass in close company through several "segments."

In a criticism I ventured to question the accuracy of this statement, which Capt. Lloyd now repeats, suggesting that my criticism was the result of trusting to unaided vision.

My criticism was based on observations made on six worms specially dissected for the purpose. In all six, my own vision was aided by a 1″ power of the miscroscope; in five by laying the dissected duct longitudinally on the stage; the sixth by means of sections cut in parafin, further examined by the $\frac{1}{8}$th objective.

In all the observations my vision was corroborated by that of four graduates in Biology, two of them tutors of many years' standing. A seventh worm has since been sectioned.

In no case have I found two ducts completely separate as described and drawn above by Capt. Lloyd. In some a slight grooving or "fluting" could be seen, but in all cases the duct or ducts were firmly united in a common outer fibrous (?) coat. In one sectioned worm there was a single lumen lined by a single layer of epithelial cells. In the other there were two distinct lumina firmly bound together by a common outer coat.

This outer coat could in no way be mistaken for part of the body wall from which in most segments it stands out so freely that, unless care be taken to fix the section well to the slide, the portion of duct is likely to be washed away.

In no case could any student dissect or separate the ducts from one another.

Let me point out that there are two distinct structures attached to the œsophagus in the anterior (5th and 6th) segments of this worm:—

(*a*) Capt. Lloyd's bunch of grape-like glands of which he gives above an excellent drawing. I acknowledge with pleasure that my attention was first drawn to them by Capt. Lloyd himself a year or two ago in conversation.

(*b*) Large tufts of nephridia which require to be dissected away before (*a*) can be seen.

I regret that my remarks about the œsophageal glands were so losely worded. An answer to Capt. Lloyd's query "How about the perplexed "student, who in Bombay no less than in Calcutta, is urged to see things "as they are?" will best explain what I wanted to convey.

I had supplied some thirty copies of Capt. Lloyd's book to my students.

Every one of these students when dissecting, with the aid of the book, identified the tufted nephridia as "œsophageal glands."

Capt. Lloyd's description is: "These are a pair of conspicuous glands which look like a bunch of red grapes".

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Had Capt. Lloyd made any mention whatever of the much more conspicuous "tufts," there would have been no excuse for the students.

As these "tufts" are more conspicuous, larger, and have to be displaced or dissected away before Capt. Lloyd's œsophageal glands are exposed, I think the student may well object to the term "conspicuous" as used by Capt. Lloyd.

The red colour is transitory and only seen in recently killed worms.

My student's class takes place in the cold weather when the worms have been preserved in spirit for some time.

The words "these structures are undoubtedly nephridia," used by me in my critique, were not with reference to Capt. Lloyd's glands. They follow immediately and obviously refer to "what Powell has described as mop-shaped or compound nephridia."

Capt. Lloyd apparently has either not seen these structures or does not believe they are nephridia. He naively suspects that because some fancied "Zoologist of European reputation" has said they are nephridia, I blindly accept his authority!

I know of no European authority, who has described these particular glands; my sole authority is the worm itself in whom I shall trust, even if contradicted by Indian authorities.

On removing the "fluff" from the 5th segment, it is seen to be mainly composed of tubules clearly of a nephridial character. The fluffy ball in the 6th segment is clearly seen by the aid of a lens to be made up of a number of strings exactly like a miniature mop attached to a common handle.

Under the microscope and with the aid of sections, each of these strings is seen to be a tubular structure opening into the cœlom by a slightly funnel-shaped aperture bearing a ciliated epithelium.

The lumen of each tube appears as it bored through the epithetial cells. These epithetial cells are continuous throughout all the tubules and their lumen opens into a common duct, the "handle" of the mop.

I repeat *these structures are undoubtedly nephridia*, and answer in all respects the definition of a nephridium morphologically.

As I have said nothing whatever about their function I fail to see the relevance of his assumption that I hold any particular beliefs as to the secretion of these organs or what becomes of it.

A. POWELL.

BOMBAY, 28*th August* 1911.

No. LIII.—A NATURAL BIRD-LIME.

While walking along an elephant dragging path in the north of Barateng Island in the Andamans with Sir Henry Farrington, Bart., Deputy Conser-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

vator of Forests a few days ago, we were attracted by the cry of a fully fledged young White-collared Kingfisher (*Sauropatis chloris*) lying helpless on the ground and picking it up, found that its wings and feathers were hopelessly together by the glued seeds of *Pisonia excelsa*, Blume, some of which I enclose for your inspection. It will be noticed that there is a thick line of an extremely viscid fluid along each of the 5 angular sides of the nearly cylindrical seed of this species, sufficiently sticky to fasten the wing feathers of a fairly large bird together and to those of its body. It was with considerable difficulty that the seeds by which the feathers were stuck were pulled off, and this was not done without leaving a considerable amount of the sticky fluid on the feathers and pulling out many of them; had we not come to the rescue of the bird, it must have inevitably died as it could not have possibly extricated itself. The bird was not on the path when we first passed along it, and it was only on our return to camp after being in the forest for about two hours that we found the bird. It is probable that the young bird had been reared in the tree and was caught by the seeds as soon as it had fluttered out of its nest. The tree is a free flowerer, and may account for the deaths of numbers of young birds annually.

C. GILBERT ROGERS,
Conservator of Forests, Pegu Circle,
Lower Burma.

RANGOON, 13*th April* 1911.

[On receiving the above note, we were doubtful of the identification of the Kingfisher mentioned and wrote to Mr. Rogers, who kindly sent us a description of the bird, and from that it seems to have been a white-collared Kingfisher, *Sauropatis chloris*. As regards the seeds Dr. Willies, writing in *Flowering Plants and Ferns* under the head of "Pisonia" says :—" The Anthocarp is glandular and is one of the few fruits which are able to cling to feathers. Forbes states that on the Keeling Islands the fruits adhere to the feathers of herons in such quantities as sometimes absolutely to cripple them, or even to cause their death'.'—EDS.]

No. LIV.— NATURAL SELECTION.

At the risk of appearing over-captious, I would ask to be allowed space in the Journal to traverse a statement appearing on page 848, Vol. XX, No. 3, in Capt. Lloyd's note on a "Hyæna with deformed feet."

The sentence is as follows :—"According to the selection theory a species is not only brought into being by natural selection but after its arrival is kept constant by the same means; that is to say, it is believed that any *individuals which differ appreciably from the type of the species must die out, because they are less suited* to the circumstances of life than their fellows."

The italics are mine and denote the words I take objection to. I do not think that they present a fair conclusion from anything advanced by

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a respectable selectionist. To hold such an opinion argues a belief that the life of the world has arrived at finality and that all types are perfectly adapted to their surroundings. This no true selectionist will accept. No one affirms, as far as I know, that an individual differing from type *must die*. That would mean that the variation must necessarily be injurious and emphatically so. The individual will die if the divergence is a sufficiently harmful one. Otherwise it will fail to reproduce itself, or reproduce in diminishing ratio or simply not transmit the "acquired character," according to the degree in which the variation is prejudicial.

On the other hand, when the modification is beneficial it is likely to endure and eventually evolve a new species.

It may be pointed out here that it is too often forgotten that there are two distinct lines in variations leading to evolution : those that are noxious or beneficial to the individual and those that affect the race or community. The later case, of course, comes more into play among social and gregarious animals and many instances will occur to anyone conversant with the subject of certain traits which, though injurious to the individual, are sufficiently beneficial to the race as a whole to outweigh the detriment to the individual.

Loose expressions in regard to Natural Selection are so frequent, and these are readily seized upon by opponents to throw discredit upon it that I feel that little apology is needed for at once contradicting a misstatement or incorrect inference.

C. E. C. FISCHER, I.F.S.

COIMBATORE, 1st March 1911.

No. LV.—IMMUNITY OF ANIMALS TO SNAKE-BITE.

In a recent article in the *Indian Field* on the subject of my heading, I was surprised to find the statement that the mongoose is completely immune to the effects of snake venom. After consulting our Journal, articles in which provided the only information to my hand, I wrote a letter on the subject to the paper in question, the substance of which I have transcribed for publication in the Journal in the hope of eliciting further information on an interesting question.

In the first place, if the mongoose be entirely immune, why should he occasionally show fear of a cobra, and always, as I believe to be the case, display great activity in avoiding a bite ?

The *Indian Field* article does not give the name of the French writer by whom the complete immunity of the mongoose is said to have been proved. Professor Calmette, not the least eminent French authority on snake poisons, arrived at a different conclusion. He found that eight times

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the dose of venom sufficient to kill a rabit proved fatal to a mongoose in twelve hours; and, as the result of his experiments, concludes:—"The mongoose is able to bear without discomfort very considerable doses relative to its size, but its immunity is not absolute. If it generally triumphs in its struggles with venomous snakes, it is chiefly due to the extreme agility with which it is endowed." It is not quite clear whether these experiments were made with the poison of the cobra or with that of the West Indian "fer-de-lance" (*Lachesis lanceolatus*): apparently the latter.

Again Fleet-Surgeon G. W. Bassett-Smith writing in the "Encyclopædia Medica" in 1902 remarks:—"The mongoose is remarkably resistant to cobra poison, requiring from 10 to 25 times as much venom per kilo. as a rabit, to produce lethal effects."

It is obvious then that a mongoose's chance of life, once he is bitten while greater than a rabbit's, yet depends on the quantity of venom injected, being less than a fatal dose for him. It may be of interest to consider whether the amount of poison injected by a bite from an average cobra under normal conditions would be more or less than enough for a mongoose.

Now the minimum lethal dose of cobra poison for a rabit is, according to the late Major Lamb, I.M.S., ·035 millegrammes per kilogramme of the animal's weight. Taking the highest estimate of the dose for a mongoose, 25 times the above is 8·75 millegrammes per kilo. If a mongoose weighs 2 kilos, which, I doubt, it follows that 20 millegrammes would be more than a fatal dose. Now a medium-sized cobra will (again according to Lamb) yield about 200 millegrammes of venom, while the fatal dose for an average man is calculated at about 50 millegrammes. We have too good reason to know that the latter dose and more is frequently injected, and it is probable that a healthy cobra can, on occasion, inject the whole content of its poison gland at a single effort. It is, therefore, beyond question that the danger, to a mongoose attacking a cobra, of receiving a fatal bite, if fairly struck, is considerable.

It appears then that the undoubted anti-toxic qualities existing in the blood of the mongoose are not of themselves sufficient to secure more than a very partial immunity.

Bassett-Smith writes:—"Elliott believes that the success of this animal in fighting cobras depends on (1) its great agility, (2) its habit of setting up its fur, thus deluding the snake as to its vulnerable part. Its immunity is due to the habit it has of seizing the snake by the head, and often by so doing, incising the poison-gland with its sharp teeth, causing the venom to escape and be swallowed by the mongoose; this would also reduce the possible amount to be injected down the fang. Then there is the inoculation of minute quantities of venom from repeated but ineffectual scratch

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bites. In these ways a partial immunity, which is hereditary, is established, becoming lost in time if the animals be removed to countries where cobras do not exist."

This theory is a plausible one. But there is a stumbling-block. It is not difficult to imagine a mongoose, by reason of his agility and increasing experience, surviving a number of encounters at the cost of a few scratches which the antidote in his blood has prevented fron having fatal effects. These successive inoculations together with the poison swallowed at times would tend to increase his immunity, so that an elderly individual might take a good deal more killing than a comparative youngster.

But can this additional immunity acquired from inoculation be transmitted to the animal's offspring ? It is the old question of the heritability of accidentally acquired characters, often affirmed but never proved. Possibly the mongoose may eventually afford the evidence that has hitherto been sought in vain. (I offer this suggestion gratis to any advocates of the theory who may be on the look-out for new lines of investigation. It should be simple enough. Start a mongoose stud and inoculate each generation up to the limit: in course of time, if your breed be a good one you should be in a position to supply all the laboratories in the country with anti-venine !)

It may be that the fact of the immunising factor being an anti-toxin in the blood places it in a different category to other acquired characters, as it would seem possible for the embryo to be inoculated before birth from the anti-toxic element in its mother's blood. If so, it is sure to be a well-known fact, and I have, in the valour of my ignorance, been merely tilting wind mills. I must take my chance of that !

If this is not the case, however, and we decline in the absence of satisfactory proof to believe that acquired characters can be inherited, it follows that we are in entire ignorance as to how the mongoose's existing inherited partial immunity originated, though it has doubtless been strengthened in some measure by centuries of natural selection. From this the further conclusion may be drawn that this inherited immunity probably almost certainly differs in its nature from such additional immunity as the individual animal may acquire from inoculations during its life-time.

This conclusion is found to be of value when considered in relation to an important fact, which I have not yet mentioned: I mean the fact of the highly specific character of snake venoms which appear to have been established beyond question by the most recent investigations, alike in India, Australia and America, the consequence of which is that an anti-toxin obtained from the poison of the cobra, for instance, is absolutely ineffective as a curative against the poison of krait or daboia—Calmette's original belief to the contrary notwithstanding.

Hence it is to be deduced that any immunity which the Indian mongoose

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

may acquire from inoculation with the venoms of Indian snakes will afford it no protection against the bites of distinct species from other parts of the world. But it *may* be the case that the *inherited* immunity of whose origin we are ignorant, does possess a more general protective power.

I am under the impression, which may be mistaken, that the venom of *Lachesis lanceolatus* is relatively less deadly than that of the Indian cobra. If so, it is of interest in this connection to note that Professor Calmette's experiments appear to indicate a lessened degree of immunity in respect of the former species.

As to whether, or how far, the Indian mongoose is, in point of fact, protected against venomous snakes other than Indian, I have no knowledge. He may be quite unaffected by a dose of 10 to 15 millegrammes of cobra poison or of 3 or 4 millegrammes of the krait's deadlier prescription, but personally I should hesitate to back his chances against a proportionate injection of the venom of, say, the Australian Tiger-snake or the rattle-snake.

If, however, the inherited immunity of the mongoose is found to be at all general, as the article in the *Indian Field* implies, the theory is at once shown to be impossible, that such immunity was originally due to the effects of inoculation through successive generations with the venoms of such snakes only as inhabit the same countries as itself. Unless, indeed, the father of all serpents inoculated the father of all the mongoose tribe with a venom containing all the characteristics of all the various specialised snake venoms now in existence!

If I have ventured to write rather a long screed on a subject I know nothing about, it is in the hope of inducing one or two of those who do know to put pen to paper for the benefit of myself and other dwellers in ignorance. Can any Members give evidence as to a suggested immunity to snake-bite on the part of the *Felidæ*?

I should mention that the quotations I have made from Calmette and Bassett-Smith are taken from the Society's Journal, Vol. XI, p. 516, and Vol. XV, p. 115. Major Lamb's figures are from articles in Vol XIV, p. 221, and Vol. XVII, p. 16.

Since writing the above, I have come across a reference which, with regard to the *Felidæ*, may be worthy of note. Major Wall in Vol. XVII of the Journal, p. 383, quotes Mervyn Smith as stating that "the tiger slayers in Chota Nagpur poison their arrows with cobra-poison and set them in traps to be sprung. When wounded, the Tigers go off and soon die, their movements being watched by the hunters."

A. H. MOSSE, CAPTAIN, I.A.

DWARKA, *5th May* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. LVI.—NATURAL HISTORY NOTES FROM THE RED SEA.

The following notes made on the voyage out on the P. & O. S.S. "Caledonia" may interest members:—

Birds.

Grey Wagtail	19th Mar. 1911	23·14 N.	32·E.	473 miles from Port Said.
3 Quail	20th Mar. 1911	18·53 N.	39·33E.	Flying from W. to E. singly at 8 A.M. against a strong N. E. wind.
3 Hoopoes	20th Mar. 1911	12·34 N.	46·39E.	At 9 A. M. near "Twelve Apostles" flying from W. to E.

Insects.

Catapsilia crocale, 20th Mar. 1911, 17·0 N., 40·E. About 50 miles from land. This butterfly fluttered round the ship at dusk and eventually was blown away by the N. E. wind blowing at the time. The same morning noticed a small noctuid moth which also disappeared overboard, but I failed to identify it.

F. HANNYNGTON, I.C.S.

CALCUTTA, 14*th April* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PROCEEDINGS.

MEETING IN BOMBAY.

A meeting of the members of the Bombay Natural History Society took place on Tuesday, 8th August 1911, at the Society's Rooms, Mr. John Wallace, C.E., presiding. The election of the following 54 new members since the last meeting was duly announced:—New Members.—Lt. H. F. E. Childers, Burma; Mr. F. A. Heron, Punjab; Mr. G. M. Carson, New Guinea; Lt. F. R. Cosens, Colombo; Mr. L. Aubert, B.A., B.Sc., F.R.G.S., Burma; Mr. G. R. Higginson, Lucknow; Messrs. John Bale Sons, and Danielsson, Ld., London; Mr. Jehangir D. Vakil, Bhavnagar; Mr. E. D Chanter, Rangoon; Mr. H. H. L. Prendergast, Arkonam; Mr. J. Pemberton Cook, Burma; Mr. R. C. C. Campbell, Burma; Mr. Motilal Vallabhji Bombay; Mr. H. E. Cross, Naini Tal; the Mess Secretary, R. A. Mess, Roorkee; Mr. F. A. Clift, Burma; Mr. J. C. D. Raper, A.M.I.C.E., V.D., Lanowli; Mr. M. Machaya, Bangalore; Capt. H. G. Andrews, Bombay; Mr. H. V. O. Donel, Alipur, Duars; Mr. N. Marryatt, Abu Road; Mr G. E. R. Slade, Sabarmati; Major N. W. Haig, Mhow; Capt. F. B Nixon, Mhow; Dr. T. H. Bishop, Kaksey, E. Bengal; Mr. V. A. Julius, Colombo; Mr. S. G. Butler, Assam; Mr. R. S. Croup, I.F.S., Dehra Dun; Mr. Thrusten Hamer, Ceylon; Mr. S. R. S. Congreve, Coimbatore; Mr. M. S. Merrikin, Maubin; Mrs. J. L. Panday, Bombay; Mr. G. Mackrell, Sylhet; Mr. H. Hampton, Rangoon; Capt. J. W. Pickthall, Rangoon; Mr. F. Clayton, Nagpur; Mr. J. Aird, Nilgiris; Mr. A. P. Warburton, Kindat; Mr. S. W. Kemp, Calcutta; Mr. F. H. Gravely, Calcutta; Mr. L. B. Firth, Calicut; Mr. G. S. Shirley, Rangoon; Mr. N. G. Webb, Duars; Mr. J. L. Durant, Duars; Mr. C. R. Peters, Benares; Mrs. C. T. Wheeler Cufte, Rangoon; Mr. D. W. Rae, Kachin Hills; Lt. G. S. Smart, R.A., Burma; Major A. Scott, Pachmarhi; Lt. R. W. Hingston, I. M. S., Bombay; Mr. P. B. Joly, China; the Mess President, 42nd Deoli Regiment, Deoli, Rajputana: Lt. S. Murray, Satara; and Lt. R. Wallace, Satara.

CONTRIBUTION TO THE MUSEUM.

The Joint Honorary Secretary, Mr. N. B. Kinnear, acknowledged the following contributions to the Museum since the last meeting:—

Contributor.	Locality.	Donor.
A number of bats	Ratnagiri ..	Mr. G.S. Hardy, I.C.S.
2 Thar, *Hemitragus jemlaicus*, skins and skulls. 1 Musk deer *Moschus moschiferus*, skin and skull. 1 Himalayan Black Bear, *Ursus torquatus*, skin and skull.	Garhwal ..	„ J. C. Pickersgill Cunliffe.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Contributor.	Locality.	Donor.
Hog deer, *Cervus porcinus* ..	Sind ..	H. H. the Rao of Cutch.
Oorial, *Ovis vignei*, skin and skull..	S. Persia ..	Mr. G. B. Scott.
Young Markhor, *Capra falconeri*, skin and skull.	Chitral ..	Capt. R. A. Lyall.
Flying squirrel *Petaurista cinderella*.	Satpuras ..	Mr. A. H. A. Simcox, I.C.S.
Flying squirrel, *Petaurista cinderella*.	Khandwa ..	„ J. K. Morton.
Flying squirrel, *Sciuropterus sp.* ..	Siam ..	„ J. Keddie.
Small Indian Civet, *Viverricula malaccensis*.	Saugor ..	„ D. O. Witt.
Leopard Cat, *Felis bengalensis* ..	Meerpore, Bengal.	„ J. E. Walker.
Toddy Cat, *Paradoxurus niger* and Jackal, *Canis aureus*.	Dibrugarh ..	Major W. White.
Tickell's Staphida, *Staphida striata*.	Karin Hills ..	Hon'ble S. Robertson.
European Bustard, *Otis tarda* ..	Chitral ..	Lieut. Stirling.
Eggs of Small White-throated Babler, *Dumetia albigularis*.	Horselykonda ..	Mr. P. R. Allen.
Tern, *Sterna media*	Bombay Harbour.	„ S. H. Prater.
John's Earth snake, *Eryx johni* (alive).	Khandesh ..	„ A. H. A. Simcox, I.C.S.
Rusell's Earth snake, *Eryx conicus* (alive).	Santa Cruz ..	Major C. H. Ward.
Zamenis diadema and Russell's Earth snake, *Eryx conicus* (alive)	Jodhpur ..	Mr. H. N. Ward.
Cobra, *Nia tripudians*	Shekh-Buddin..	Capt. A. H. Napier.
Cobra „ „	Bombay ..	From the collection of the late Dr. B. Desai through V. N. Gorackshaka.
Skink, *Mabuia carinata* with deformed tail.	Bombay ..	Mr. C. C. Stileman.
2 Flying Lizards, *Draco*	Siam ..	„ J. Keddie.
A number of lizards	Almora ..	Major F. Wall, I.M.S.
Several Fish	Mazagon ..	Mr. V. H. Gutleridge.
A number of Butterflies	Simla ..	Capt. Thornhill.
50 Eggs of the Mugger or Broad snouted crocodile, *Crocodilus palustris*.	Vihar ..	Mr. P. R. Cadell, I.C.S.
Some Centipeds	In exchange ..	Indian Museum.

Minor contributions from Miss P. Threlfell, Messrs. H. E. Standage and T. Croft, R. W. Harter, S. H. Prater, P. Gomes, W. Walsh, C. E. C. Dawkins, N. Kerr, H. Navalkar and Capt. W. Cullen.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

INDIAN MAMMAL SURVEY.

The Secretary announced that since the last meeting of the Society, Rs. 9,000 had been received, making a total of Rs. 19,000 up to date. Amongst the principal contributors were H. R. H. the Duke of Connaught, H. H. the Nizam, Mr. Ratan J. Tata, H. H. the Gaekwad of Baroda (2nd donation), and Lord Reay. He read a letter which had been received from H. E. the Viceroy expressing his approval and interest in the scheme. He said, now that the total sum had reached Rs. 19,000 it was proposed to bring out a second collector and Mr. Millard, who was at home was endeavouring to secure the services of Mr. G. C. Shortridge (late of the British Ornithologists expedition to New Guinea). If Mr. Shortridge's services were secured he would arrive out here in the beginning of October, and starting at Dharwar, would work South India and the East Coast. Since the last meeting two more consignments of skins had been received from Mr. Crump, one from Khandesh and one from the Berars containing some interesting specimens. Whilst in the Berars Mr. Crump received great help from all the officials, and the thanks of the Society were due to them for their kindness and the interest they had taken in the scheme.

For the last month Mr. Crump had been in Cutch, where he was making large collections, and a consignment of skins was expected shortly. The Cutch collections would be extremely valuable as there were a number of species peculiar to Cutch, and it would be interesting to see how the fauna compares with that of Sind and Kathiawar.

H. H. the Rao of Cutch, who has taken a great interest in the survey, had been assisting Mr. Crump in every way. All the specimens collected in Khandesh had been sent home and were now being worked out by Mr. R. C. Wroughton at the British Museum from whom a report was shortly expected.

Mr. S. P. Agharkar exhibited and made some remarks on a specimen of a fresh-water medusa (*Limnocnida*) found by him in the pools of the Koyna and Yemna rivers.

The following paper on "White Ants and their ways," was then read by Revd. J. Asmuth, S.J.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CONTENTS OF THIS NUMBER—(*contd.*).

PAGE.

A NEW SNAKE FROM THE WESTERN HIMALAYAS *Trachischium quinquelabialis*. By Major F. Wall, I.M.S., C.M.Z.S. 201

PLANTS OF THE PUNJAB. A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR. Part IX. By Colonel C. J. Bamber, F.L.S. 203

PROGRESS OF THE MAMMAL SURVEY 229

MISCELLANEOUS NOTES :—

No. I. Tiger calling like a Sambur. By Major H. H. Harington, and J. W. Best, I.F.S. 235

II. Young Tiger attacking human beings. By H. E. Cross. 236

III. Panther and Wild Boar. By Lt. F. Fitz-Gibbon.... 237

IV. Golden Cat, *Felis temmincki*, killing Buffalo Calf. By N. B. Kinnear..... 238

V. Mungooses in the Eastern Ghats. By P. Roscoe Allan 238

VI. Distribution of the Sloth-Bear (*Melursus ursinus*), and the Indian Lion (*Felis leo*). By R. Khengarji 238

VII. The Birth of the Wild Elephant Calf. By C. W. Allen, D.F.O. 239

VIII. Notes on the Gaur (*Bos gaurus*). By Aylmer F. Martin 241

IX. The Domestic Breeds of Indian Sheep. By H. J. Elwes, F.R.S. 245

X. Weight and Measurements of a Serow. By A. M. Primrose 246

XI. Weight and Measurement of a Goral. By A. M. Primrose 247

XII. Strange mortality amongst Black Buck (*Antilope cervicapra*). By Lt.-Col. G. H. Evans, I.C.V.D.... 247

XIII. Large heads of Malay Sambar and Brow Antlered Deer. By H. J. Davis, F.G.S. 248

XIV. Crow and its Food. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 248

XV. Notes relating to the habits and nidification of the Black-Headed Sibia, *Lioptila capistrata* (Vigors). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 249

XVI. A New Bar-Wing from Burma..... 256

XVII. Curious behaviour of a Myna. By Lt. F. B. Scott .. 257

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CONTENTS OF THIS NUMBER—(*contd.*).

PAGE.

MISCELLANEOUS NOTES—*contd.*

XVIII. Notes on Birds round Rawalpindi. By H. Whistler. 257

XIX. Notes on the nidification of *Microcichla scouleri* (Vigors), The Little Forktail. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 257

XX. Nesting Notes from Lower Burma. By S. M. Robinson 261

XXI. Some Winter Visitors to Rawalpindi. By H. Whistler 261

XXII. Seasonal movements of the Himalayan Greenfinch (*Hypacanthis spinoides.*) By Capt. R. B. Skinner, R.E. 261

XXIII. Occurrence of *Hemilophus pulverulentus* (Temm), the Great Slaty Woodpecker, in the neighbourhood of Simla, N.-W. Himalayas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 263

XXIV. Hornbill devouring young Paroquets. By Lt.-Col. A. Newnham, I.A. 264

XXV. Jack Snipe in the Cawnpore District. By Capt. W. B. Spalding, R.A. 264

XXVI. Nesting of the Cinerous vulture (*Vultur monachus*) near Quetta. By Major T. E. Marshall, R.E. 264

XXVII. Uncommon Birds in Burma. By J. P. Cook 265

XXVIII. Falcon and Gulls. By Lt.-Col. S. E. Prall, I.M.S. 267

XXIX. Nesting of the Osprey or Sea-Hawk. By Lt.-Col. S. E. Prall, I.M.S. 268

XXX. European Great Bustard in Chitral. By N. B. Kinnear. 268

XXXI. Woodcock in Kulu. By J. Coldstream, I.C.S. 268

XXXII. Occurrence of Swinhoes Snipe (*Gallinago megala*) at Myitkyina, Upper Burma. By Capt. F. E. W. Venning 269

XXXIII. Occurrence of the Pantail Snipe (*Gallinago cœlestis*) in Siam. By D. O. Witt, I.F.S., and W. J. F. Williamson 269

XXXIV. Snipe Shooting in Upper Burma. By E. N. Bell 272

XXXV. The Occurrence of a "Booby" *Sula cyanops* at Cannanore. By Major H. R. Baker 272

XXXVI. The Occurrence of *Cygnus bewicki* and other Swans in India. By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U. 273

XXXVII. Uncommon Birds in the United Provinces. By Capt. M. A. Gudlestone, 41st Dogras 274

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

JOURNAL
OF THE
Bombay Natural History Society.

MARCH 1912. VOL. XXI. No. 2.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART VI.

(*Continued from page 47 of this Volume.*)

ERRATA.

In Vol. XXI, No. 1, page 43, two paragraphs containing a note by Mr. M. M. Currie on the Houbara have by mistake found a place in my article on *Otis tetrax*, The Little Bustard. These two paragraphs have now been inserted in their proper place in the article on *Houbara macqueenii* and should be considered as deleted from that in the former number.

In the key to the genera of Otididæ, p. 21, after—

"b^1 wing under 16"...Sypheotis" there should be ♂

After—

"a^2 wing more than $\frac{1}{3}$ length of wing...Sypheotis", there should be ♀.

Genus—*EUPODOTIS*.

This genus, which contains but one species occurring within our limits, the largest of our Indian Bustards, can be distinguished at

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a glance from any other by its large size, combined with its black-crested crown. The sexes are alike in plumage but the male very greatly exceeds the female in size. The genus *Eupodotis* contains altogether four species, two African, one Indian, and one, which, as I have already said, is very closely allied to the latter, Australian.

EUPODOTIS EDWARDSI.

The Great Indian Bustard.

Otis edwardsii.—Gray, in Hardw. Ill. In. Zool. 1. (1830); Hume, Str. Feath. 1, p. 227; Adam, ibid, p. 393; id, ibid, ii, p. 339.

Eupodotis edwardsii.—Blyth, Cat. B. Mus. As. Soc., p. 258.

Eupodotis edwardsi.—Jerdon, B. of I. iii, p. 607; Stoliczka, J. A. S, Bengal, xli, p. 250; Hume, Nest & Eggs, I. B., p. 557; id, Str. Feath. i, pp. 125, 237; Butler, ibid, iv, p. 9; Ball, ibid, p. 234; Fairbanks, ibid, pp. 262, 266; Hume & Marsh, Game B. of I. i, p. 7; Davids & Wend, Str. Feath. vii, p. 87; Ball, ibid, p. 266; Tweedie, ibid, p. 528; Hume, ibid, viii, p. 111; Wilson, ibid, p. 490; Butler, Cat. B. Sind, etc., p. 56; id, Cat. B. of South Bom. Pres., p. 71; Davidson, Str. Feath. x, p. 318; Murray, Vert. F. of Sind, p. 217; Barnes, B. of Bombay, p. 320; Oates in Humes N. & E, 2nd Edit. iii, p. 375; Blyth, B. of India, iv, p. 194; Sharpe, B. M. Cat. xxiii, p. 325, id, Hand. List i, p. 176; Oates, Cat. Eggs B. M., ii, p. 90; Oates, Game-Birds i, p. 399; Barnes, Bom. Nat. His. Journal, i, p. 57; Rayment, ibid, ix, p. 107.

Vernacular names.—Ghorar, *Kathiawar;* Tugdar, *Punjab;* Gurayin, *Hariana;* Sohum, *Gughunbher*; Hukna, *H.;* Serailu, *H.* (Nerbudda); Bherar, *Saugor*; Hum, *Mahr.;* Mardonk, Maldhonk, Karadhonk, Karlunk, *Deccan;* Tokdar *of Mahomedan Falconers;* Gurahna, *Sind;* Bat-Meka, Bat-myaka, *Tel.;* Batta-mekha, *Yanadi*; Gunad, *Pardi;* Kanal-Myle, *Tam.;* Heri-hukki, Arl-kujina-hukki, *Yereladdu Can.*

Description, Adult male.—Crown from bill to nape black with a certain amount of white stippling near the forehead and with the nape mixed black and white, remainder of head and neck white, pure in very old birds but faintly barred with brown or brownish black, more especially on the upper neck, in young birds. Back,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

rump and upper tail-coverts, together with scapulars, inner secondaries and lesser wing-coverts deep buff, finely vermiculated with black; the median wing-coverts are dark greyish or brownish black generally tipped with white, greater coverts deep grey, edged black and tipped white; primaries dark brown becoming more grey on the innermost; outer secondaries dark grey, these and the primaries all tipped with white and the inner ones marked with a white band on the inner web. Underwing coverts white; flanks dark grey; tail like the back but more grey and with a broad terminal band of blackish brown, with the outermost one or two pairs of rectrices tipped white. A broad black band across the breast often continuing right round to the hind neck where it divides the white of the neck from the buff of the back. Undertail coverts and feathers round vent blackish brown, marked with white and with white tips; thighs generally much marked with black and sometimes entirely black; rest of underparts white.

"The legs and toes are generally yellowish creamy, a little dingy on the toes; but I have noticed specimens in which the legs had more of a light fleshy tinge and others in which the pale yellow had a grey or plumbeous tinge; the irides vary from pale to light yellow; the bill is greyish brown to greyish white, dusky at tip and near forehead, and often a little yellowish below." (Hume.)

"Length 45 to 50 inches; expanse 86 to 96; wings 24·5 to 29; tarsi 7·5 to 8·37; bill to gape 4·0 to 4·75; weight 17 to 22 lbs." (Hume).

The middle toe averages about 2·95″ in length.

Jerdon gives the weight as up to 28 lbs., but this weight is unusual. The heaviest I have received any record of is one shot by Major A. B. Burton of 26½ lbs. and Col. L. L. Fenton gives the average weight of cocks as 21 lbs.

Blanford in "Avifauna of British India" gives the weights of hens as 10 lbs. and of cocks as 25 lbs. to 35 lbs. and says that birds of 40 lbs. have been recorded. I cannot trace these records and there may possibly be some mistakes about them.

The crest feathers are about 2″ in length.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Adult female.—The adult female only differs from the male in being very much smaller, in having the white of the head and neck less pure and more vermiculated with black bars and in having the pectoral band absent or only faintly indicated except at the sides. Length of wing 18″ to 22″; tail 9″ to 10″; tarsus 6·20″ to 6·50″; middle toe about 2·5″; bills, culmen 2·20″ to 2·35″; from gape 3·00″ to 3·20″.

Weight from 8 to 11 lbs., running up to 13 lbs., but sometimes heavier still, as Capt. J. R. J. Tyrell informs me that in December 1905 he shot a female weighing between 14 and 15 lbs. not far from Dhar in the Bhopawar Agency, C. I., whilst Major Burton records three hens between 17 to 18 lbs.

The crest feathers are not often as fully developed as in the male.

Young male.—Resembles the female but with buff spots on the crown, hind neck and upper back.

Nestling.—Covered with down, buff above with black marks on the head and upper back; below white or buffy white.

The distribution of the Great Indian Bustard, which is not, of course, found outside Indian limits, is thus given by Blanford in the fourth volume of the "Avifauna of British India." The Plains of the Punjab between the Indus and the Jumna, also Eastern Sind, Cutch, Kattyawar, Rajputana, Guzerat, the Bombay Deccan, the greater part of the Central Provinces, extending as far East as Sambalpur, the Hyderabad territories, and parts of the Madras Presidency and the Mysore State as far South as Southern Mysore and perhaps further South. Stragglers may be found outside the area specified, as in Western Sind, Meerut and Oudh; but the Bustard is unknown in Behar, Chota Nagpur, Orissa and Bengal, on the Malabar Coast and in Ceylon."

Oates, in his "Game Birds" thus briefly describes its habitat: "It is found in the Punjab and less commonly in Sind. To the East it ranges as far as the Jumna and approximately up to a line, roughly speaking, connecting Delhi and Sambalpur in the Central Provinces. Southwards it is met with down to about the 11th degree of North latitude."

Capt. K. L. W. Mackenzie, of the 62nd Punjabis, writes to me that he shot "one of a party of four hen Great Indian Bustard at

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a place called Meja in the Allahabad District, about half way between Allahabad and Mirzapur. This is considerably further East than the limits laid down by Oates."

In "Stray Feathers," Vol. IV., Mr. F. Wilson records the fact that a few Great Bustard are always to be found in Mazuffernugger during the cold weather, he, himself, having on one occasion seen a flock of sixteen. Mr. F. W. Butler in the same volume confirms this and says that a few are to be found in the district throughout the year. He also states that "between line of railway and the Ganges Canal, from near Roorkee to, I believe, Ghaziabad there runs a broken range of sandhills. Along the tract right and left of the range the land is high and sandy and here Bustards are to be found. I cannot positively assert that they extend into the Meerut District; but I believe such is the case; and certainly a bird is occasionally to be seen during the rains in the Saharanpur District, East of Deoband."

"In 1871 I was in the Mirzapur District. I was told by natives, and also, I think, by Mr. Pollock, C.S., that both Bustard and Florican were to be found some miles from the station, along the Great Deccan Road."

I have several letters informing me that this fine Bustard is common in parts of Eastern Sind, and by no means rare in one or two favoured localities in Western Sind. In respect to Kathiawar Col. L. L. Fenton writes "It is found throughout the Province of Kathiawar in suitable localities, which means everywhere except the Gir Forest and the Barda Hills" and he adds, "Malia on the Gulf of Cutch as well as Chotila on the old Rajkot-Wadhwan road are also good localities for them in the cold weather."

Very numerous letters from observers and sportsmen who have been good enough to report to me the result of their experiences, in some instances dating from the publication of Hume and Marshall's "Game Birds," add nothing further to the area as given by Oates and Blanford. At the same time these letters are of extreme interest as showing that the Great Indian Bustard is in many parts of India most irregular in its movements and that in other parts it is merely a seasonal visitor, either for the purpose of breeding or during the non-breeding season.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Writing of thirty years ago Col. L. L. Fenton noticed this semi-migratory habit and speaks of their being especially plentiful in the neighbourhood of the Rajkot-Wadhwan Road to the N.-W. of the Province in the cold weather and increasing greatly in numbers about Rajkot itself during the rains. Hume deals with this matter very briefly and merely says "It is to a great extent migratory, spending one season of the year in one part of the country, and moving to another to breed. Thus, for instance, in what used to be called Bhattiana, now the Sind District it is extremely abundant during the rainy season, when it breeds; whereas, during the cold season, it is comparatively scarce. Further on (p. 12) Hume quotes Davidson to the following effect "In Poona and Sholapur it is certainly a permanent resident, that is to say, that at all seasons a few may be found in all parts of the Collectorate. I think, however, that more breed in the district than are to be found there in February or March, and that birds come in, in the beginning of rains, to breed and leave when their young are able to fly."

The Great Indian Bustard usually associates in small flocks. In the cold weather two or three cocks or two or three hens may be seen keeping one another company, but in the breeding season the parties consist as a rule of an old cock bird with his harem of two to six or more wives. Sometimes, however, they collect in large droves. Jerdon says "I have seen flocks of twenty-five or more, and a writer in the *Sporting Review* mentions having seen above thirty on one small hill." Mr. E. James also records that on one occasion he counted more than thirty birds in a flock and Mr. S. Doig found no less than 34 birds feeding together in one *Jamba* field. Such flocks as these must, however, be but rare, though droves of 8 or 10 and upwards are often met with. Major A. B. Burton informs me that an officer in the Hyderabad Contingent came across 17 birds together in the Raidan Doab, and Major R. W. Burton once saw 19 birds at Tuggali, on the S. M. Railway, East of Guntakul, though on the latter occasion the birds appear to have formed two flocks, one of 6 and one of 13. Numerous other correspondents have met with flocks of 10 or 12. On the other hand, solitary birds are constantly met with at all

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

times of the year, in the cold season, especially, the birds seem to be often seen singly, but even during the rains and breeding season cock birds are often seen alone. These are probably suffering from compulsory isolation, not having been able to attract any females and unable to forcibly attach the harem of any other male. Sometimes two or three such young males may be seen together in the breeding season, seemingly sympathising with one another for the absence of female society.

There is still no general description of the habits of the Great Indian Bustard better than that of Jerdon as quoted by Hume and others. He writes "The Bustard frequents bare open plains, grassy plains interspersed with low bushes, and occasionally high grass rumnahs. In the rainy season large numbers may be seen together stalking over undulating plains of the Deccan or Central India. I have seen flocks of twenty-five or more, and a writer in the *Sporting Review* mentions having seen above thirty on one small hill. This writer states his belief that they are never seen in any district that is not characterized by hills as well as plains; but this, from my own experience I would merely interpret that they do not frequent alluvial plains, but prefer the undulating country; for I have seen them on extensive plains, where there were merely a few ridges or eminences, and nothing deserving the name of a hill close at hand. Towards the close of the rains, and in the cold weather before the long grass is cut down, the Bustard will often be found, at all events in the heat of the day, concealed in the grass, but not for the purpose of eating the seeds of the Roussa grass, as the writer above alluded to imagines, rather for the large grasshoppers that abound so there, and which fly against you at every few steps you take. During the cold weather the Bustard frequently feeds, and rests during the day likewise, in wheat fields. When the grass and corn is cut, and the bare plains no longer afford food to the Bustard, it will be found along the banks of rivers where there is long grass mixed with bushes, or the edges of large tanks, or low jungle where there is moderately high grass, or it wanders to some district where there is more grass, for though they do not migrate, yet Bustards change their ground much according to the season, and the supply of grasshoppers and other

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

insects. The hen birds, remarks the writer quoted above, generally congregate together during the rains, are very timid, and frequently, when a sportsman is pursuing a single one, she will attempt to seek safety, fatally for herself, in some large bush, particularly if the gunner turn aside his head, and affect not to see her at the moment of hiding. The cock-birds at this season feed a mile or so apart from the hens, and stretching their magnificent white necks, stride along most pompously. Besides grasshoppers, which may be said to be their favourite food, the Bustard will eat any other large insect, more especially *Mylabris*, or blistering beetle, so abundant during the rains; the large *Buprestis*, *Scarabaei*, caterpillars, etc., also lizards, centipedes, small snakes, etc. Mr. Elliott found a Quail's egg entire in the stomach of one, and they will often swallow pebbles or any glittering object that attracts them. I took several portions of a brass ornament, the size of a No. 16 bullet, out of the stomach of one Bustard. In default of insect food, it will eat fruit of various kinds, especially the fruit of the Byr (*Zizyphus jujuba*) and Caronda (*Carissa carandas*); grain, and other seeds and vegetable shoots.

"The Bustard is polygamous, and at the breeding season, which varies very greatly according to the district, from October to March, the male struts about on some eminence puffing out the feathers of his neck and throat, expanding his tail, and ruffling his wings, uttering now and then a low deep moaning call heard a great way off. The female lays one or two eggs of a dark olive green, faintly blotched with dusky. I have killed the young, half grown, in March near Saugor.

"The Bustard has another call heard not unfrequently, compared by some to a bark or a bellow, chiefly heard, however when the bird is alarmed. This is compared by the natives to the word *hook*, hence the name of *hookna*, by which it is known to the villagers about Gwalior. When raised, it generally takes a long flight, sometimes three or four miles, with a steady, continued flapping of its wings, at no great height from the ground, and I never found that it had any difficulty in rising, not even requiring to run one step, as I have many times had occasion to observe when flushing them in long grass of wheat fields. On the open

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bare plains, it will sometimes run a step or two before mounting in the air. A writer in the Bengal Sporting Magazine asserts that he has known the Bustard ridden down, and that after two or three flights it is so exhausted as to allow of its capture. I imagine that a healthy bird would tire out the best horse and rider before giving in."

Referring to Jerdon's remarks on the "showing off" of the male bird at the commencement of the breeding season, Hume remarks:—"The way in which the male expands the throat at times during the breeding season is most extraordinary. Twice I have closely watched the whole process through binoculars. First the male begins to strut about, holding his head up as high as if he wanted to lift himself off his legs; then, after a few turns, he puffs out the upper part of the throat just under the jaws, then draws it in again, then puffs it again, and so on, two, three or four times, and then, suddenly out goes the whole throat down to the breast, and that part of it next the latter swells more and more; his tail, already cocked, begins to turn right back, over the back, and the lower throat bag gets bigger and bigger, and longer and longer, till it looks to be within six inches of the ground. All the feathers of the throat stand out, and looked at in front, he seems to have a huge bag covered with feathers hanging down between his legs, which wabbles about as he struts here and there with wings partly unclosed, and occasional sharp snappings of his bill. From time to time he utters a sort of deep moan, and stands quite still, and then off he struts again close up to the female, and then away from her. On both occasions that I witnessed these antics, the excitement seemed gradually to relax, and no connubialities resulted. Whether this is usually a prelude to such, or a mere nautch for the edification of the female, like the Peacock's grand display, I cannot tell, but I am inclined to believe the latter."

It will be seen from Jerdon's description, which I have above quoted, that the Bustard is capable, when necessary, of rising straight from the ground into full flight, at the same time there is little doubt that our Indian bird, like the European Great Bustard, prefers to run a few steps before springing into flight, though the facility with which it does this is a matter of opinion. Thus Capt.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A. H. Mosse writes :—"The big Bustard is very slow in rising and has to take 4 or 5 steps with outstretched wings before he succeeds in getting up into the air." Capt. C. Brownlow, on the other hand, writes "before rising from the ground, they ran only a few steps and rose with apparent ease." When once flushed, it flies well and strongly, though with but slow beats of the wing, and at a very much faster rate than those who have not shot at it would give it credit for. Those who have shot these fine birds soon find, however, that they fly quite as fast as smaller birds who appear to go at twice the pace and it is necessary to shoot well forward to bring them down.

In addition to the moaning call and the bark or bellow described by Jerdon, Capt. C. Brownlow mentions a third sound made by these birds. He writes to me about this as follows :—"I then saw a flock of six or seven feeding near a small village and managed to get within some 30 yards or so before they became alarmed and flew off. Whilst moving about before they were disturbed they kept up a sort of cackle."

The Bustard is a difficult bird to circumvent, affording as good sport as any game bird known, and calling forth all the cunning and patience of the sportsman.

Of course, there are occasions on which the bird's natural cuteness fails to keep it in its ordinary advantageous position in the open and the quantity of food obtainable in high crops sometimes entices it to its doom. Thus, as Mr. J. E. James records in "Game Birds," "the largest bag I ever knew was made near Malegaon, in the Nasik District, when an officer came upon a flock feeding in a field of Jowari which was above their heads. He walked them up and shot eight of them as they rose, like so many partridges."

So, also, Capt. Mosse remarks : "Occasionally the Indian Bustard may, I believe, be put up out of crops like a quail and bagged at short range. But my knowledge of him is confined to the open plains where he is ordinarily met with in these parts. He may be shot in two ways. First by stalking him with a small bore rifle, though stalking is hardly the correct term, owing to the absence of cover, which necessitates a perfectly open approach. If this be conducted with an air of indifference and by an indirect advance,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a shot may often be obtained at from 80 to 100 yards. A nearer approach is rarely possible unless there is some slight cover, grass or low bushes (for the bird I mean). In that case the Bustard will sometimes squat down flat, vanishing from sight in a marvellous manner, but unable to resist the temptation of now and then raising its head to see where you are. Now is the chance for the shot gun. Gradually lessen the distance by from 10 to 20 yards, then turn and run straight in, when, with any luck you may be able to get in both barrels at a fair range.

Mr. G. Sanderson, also, was apparently more fortunate than most sportsmen in inducing Bustard to wait for him in scrub jungle until he could get within shot. He says, *vide* Hume :—" The great Indian Bustard occurs somewhat plentifully throughout Mysore, in suitable localities, *viz.*, open plains in the vicinity of scrub jungles. I have seen five feeding together, three commonly. I believe that the Bustard in Mysore migrates. It is exceedingly wary. Its note, usually uttered before daylight, is a booming cry, not unlike a distant shout; hence it is denominated in Canarese the 'bird that calls like a man' (Arl-Koogina-Hukki).

" The Bustard feeds in stubble fields and open plains till about 10 a.m., as also in the afternoon. During the heat of the day it retires to low bush jungle. I have frequently shot Bustard by having markers posted upon commanding eminences within a circuit of three or four miles round their feeding grounds. The particular habits of the birds are generally well known locally, and when one has been marked down after its return from its morning feed, it may generally be walked up, within a few hundred yards of the place where it alighted. In the scrub jungle they frequently lie very close, and must be carefully looked for. Before I was aware of this peculiarity, I failed to find several birds. On one occasion a Bustard uttered its peculiar cry about twenty yards behind me. It had walked out of a small bush which I had passed within five yards, and uttered its note when standing on the ground."

Similar examples of a confiding disposition in the Indian Great Bustard must not, however, be *expected*, though they may be *hoped* for, by the man who wishes to bring them to bag. It will

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be wiser on his part to start with the conviction that he will have to use patience, perseverance and brains before he can pat himself on the back as being a wiser bird than the one he is after.

Driving, such as is so often successfully carried out in the pursuit of the European Bustard, is not often resorted to in India, and the destruction of our Indian bird is more often accomplished by stalking and the aid of a small bore rifle. Even this, however, is but seldom possible in the truest sense of the word, for the bareness of the country in which the game is found and the general complete absence of all real hills or elevations prevent any approach under cover.

In the "Indian Field" 1904, Major R. W. Burton gave an interesting account of a stalk which ended in success. After some preliminary remarks, he says: "At last the white neck of the cock Bustard caught my eye some 600 yards away, and in a few moments, with the aid of field glasses, three others were distinguished not far from the first and all were busy feeding. It was most interesting to watch them stalking about in the stately way they have.

"Bustard have a keen sense of smell, and as any approach except down wind appeared impossible, there was nothing for it but to wait. In the course of half an hour the birds were tending towards some higher ground on which were a few small bushes. A detour under cover of a fold in the ground took me, without any particular precaution, to within 150 yards of these, and a crawl on hands and knees and elbows, and sometimes on the stomach—all through sopping wet plough land took me some 80 yards nearer. Sitting slowly up to see where my friends were, I saw a long white neck appear round one side of a bush, about 120 yards away, peering this way and that to see what strange green and brown beast it could be sitting in the field (my shooting suit was of the greenish-brown leather mixture, and much bespattered with mud). I sat like a carved image, as the least movement would be fatal, and that curious bird actually paced slowly on until 70 yards away without being able to make me out. Opportunity was taken as the bird paused for a moment behind a small bush, with long tufts of grass growing through it, to get the little ·310 rifle to bear in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

his direction with elbows on knees ready to fire. At last discovery appeared imminent, so taking careful aim at the lower edge of the breast I dropped him with a shot through the body. Loud hoarse grunts of alarm showed me the other birds were not far off, and on my standing up the last of them flew off from some 150 yards away.

"There is no finer bird than a male of the Great Indian Bustard and the delight in handling the magnificent plumage was mingled with a genuine feeling of regret—now the excitement was over that the stately bird would no more stalk proudly his native plains."

In writing to me he adds that on another occasion he combined a stalk and a drive with great success.

"It was with reliable information of the Bustard being in considerable numbers that Major H. Greany, I.M.S., and myself took the train for a small wayside station of Tugalli, in January 1896. Within half a mile of the station we discovered 6 birds feeding among some stunted babul bushes and arranged for one of us to stalk and the other to lie up on the chance of getting a shot as the birds flew on. The stalk fell to my share and resulted in a successful right and left with S. S. G. at 60 and 90 yards rise, the other birds going straight over the Doctor who dropped one bird with S. S. G. from his right barrel and merely staggered another bird, as he had loaded the left barrel with No. 6, shot, being afraid to fire S. S. G. from the choke barrel of his best 'Alexander Henry!' The wounded bird carried on until out of sight, and we did not succeed in finding him. The three birds secured were all hens and weighed 17 lbs. to 18 lbs. each."

Another correspondent, who desires to remain unnamed, sends me a very interesting account of a two days' stalk after Bustard, which shows that success does not always attend even the hardest worker under the most advantageous circumstances. He writes: "The Great Bustard has always been an object of admiration to me, and I have spent many long days after him, sometimes with the success that makes a man feel above himself for days together, but more often, I must admit, with the failure that makes a man feel his smartness to be great depths below the bird he is after.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"In April, 1902, I had the good fortune to be stationed at .....an ideal place for Bustard in every way. Birds were remarkably plentiful, and though the ground was mostly very bare, it was rolling and even hilly in places, so that by taking advantage of the rises and dips and by making use of the tufts of grass, an odd Ber-bush or so, or of stones and rocks larger than usual, one could often carry out a genuine and successful stalk."

"Starting early in the morning, indeed, almost before it was light, I was soon on my shooting ground, but even at that time the heat was intense and already there was that shimmer in the atmosphere which foretold of the greater heat to come. Lying flat on the top of a stony ridge, the highest point in the neighbourhood, I brought my binoculars to bear on the various points of the horizon and was rewarded by seeing no less than three lots of Bustard, one consisting of eight birds, one of four and a third of two grand old cock birds. The fewer eyes to watch me, the greater the chance of getting close, so I decided to first try for these last two birds. They were a long way off, nearly a mile, so that for the first few hundred yards no very great precaution was necessary; moreover there was a crack in the ground—one could hardly call it a water-course—which led in the right direction for my stalk and by stooping low I could make use of this for a good quarter of a mile without much chance of being seen. Before making a start I located the birds as being about half-way between two stunted Ber-bushes about a hundred yards apart, and as these bushes were some two or three feet higher than the heads of the Bustard, they served as admirable marks which I could keep in view without the risk of trying to see the Bustard themselves. Down the water-course I went with success until I arrived at a place where it was too shallow to allow of my going any further except on all fours. Here, I wanted a further look for my game, so getting behind a tuft of grass, I gradually raised my head —covered with a helmet of the same colour as the stones which lay scattered in every direction—until I could peer between the withered stems. Both birds were still in the same place and were engaged in the most curious antics, bowing and scraping to one another, although there were no hens visible within miles of them.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Directly between myself and the Bustards the ground was quite bare, but a little to my left and some two or three hundred yards nearer, there were a few bushes and further on again were others I hoped to be able to make use of. Working my way on hands and knees up the rain crack, I got directly in line with the bushes, and after I had wiped the streaming perspiration from my eyes, continued, still on hands and knees, until I got behind their shelter. Arrived here, I found, I had to make my way in full view of the Bustards—now about 600 yards away—before I could get under cover of a big stone, whence I could again make my way to another clump of bushes. Down I went on my waistcoat and, yard by yard, covered 50 yards of open, halting for a few seconds whenever the birds looked my way. At last I got behind the stone and had a rest before recommencing another series of painful crawls which were to take me to within shooting distance of my game. The two Ber trees shewed up well and kept me on what I believed to be the correct line, and eventually I stopped under the shelter of a couple of bushes and some tufts of grass, which I had estimated to be within about 100 yards of the Bustard and within easy range for my little rifle. Having rested until my heavy breathing ceased I knelt up, and having mopped my face and brought my rifle to full cock, peered out. No birds! Kneeling up a little higher I looked further afield and then saw them strutting along some 200 yards beyond where they had been when first seen. Unfortunately, at the same moment one of them caught sight of me and after a second's hesitation ran a step or two and then launched on his wide pinions to be immediately followed by his companion.

"It was, however, still early, so waiting for my man to come up with my flask, I had a good drink and then once more we searched round the horizon for more birds. There they were, a flock of 8, probably the same I had seen in the morning, though they had wandered some distance since then. They appeared to be in an excellent position from my point of view for a stalk, just this side of a small rise which would keep them entirely out of sight until I should arrive within 50 or 60 yards of them. I accordingly got up and sauntered quietly away in the opposite

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

direction and so round for well over a couple of miles in a semi-circle until I had got the hillock between myself and them. I then walked about a quarter of a mile in their direction stooping lower and lower as the ground began to rise, until once more I was forced to go on hands and knees. In this way I got to within 300 yards of the top and was lying flat for a moment or two to recover my breath when, without any warning, two suddenly appeared over the crest of the hill coming straight towards me. I lay absolutely motionless, but it was useless. First one bird and then the other stopped, stretched out his head and neck, put it on one side so as to get a better focus, for a moment or two seemed to doubt whether I was a dangerous object or not and then, determined I was, they both took to flight accompanied by the remaining six birds on the far side of the hill.

"The sun was now high up and the heat intense so I made for the shade of some village trees, a weary two miles off and there I fed, drank, slept and read for the next four hours. After the rest we again set forth and it was not long before we again came upon some birds, two fine cocks, probably the same two I had tried for in the morning. The ground was favourable for a stalk and, after a repetition of the morning's work on hands and knees, ending with a crawl on my stomach for the last hundred yards or so, I got within 120 paces of the nearest cock. My only cover was a few scattered clumps of coarse grass, two or three feet high, so that I could not sit up to fire but, resting on my elbows, had to fire as I lay. Alas! the report of my rifle only resulted in both birds springing into flight and sailing away unhurt, though followed by another bullet, fired in despair.

"No further opportunities to miss or hit occurred and at dusk I made my way home a disappointed man.

"My next day's work was as unsuccessful as that already reported, practically all day I was in sight of Bustard but it seemed impossible to work within shot. Once early in the morning I had stalked a solitary bird with success and had only a few yards more to cover when he took it into his head to change quarters and join a scattered flock nearly the opposite side of the plain. A stalk of of this flock followed and I was again just congratulating myself

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on success when I blundered on a hen Bustard that was squatted in some Ber-bushes not twenty yards from me. Of course, off she went followed by the rest of the flock which I did not again see that day. Two other stalks proved failures. In the first I could not get within 300 yards of my birds, and in the second I could only get just within that distance and a shot, though it raked the feathers off the back of what seemed the largest cock, did no real harm.

"The following year I was again in the same place in February and managed to bag 5 fine cocks in one day, though I must confess that one bird was a fluke. I had had the usual painful crawl after a flock and eventually got to within sixty yards of the nearest bird which I shot through the body and then, to my delight saw another bird, not by any means in a direct line with it, and some four or five paces distant, fall struggling to the ground. When I went up to them the first bird was dead but the second was—as I afterwards found—only shot through the shoulder of the wing, quite incapacitated from flying but, as I feared, fully able to escape my running. Running away, however, was one of the last things it appeared to think of, and when I came close up to it, it assumed a most truculent air and actually advanced beating its unwounded wing noisily up and down uttering its deep cry at quick intervals. There was no stick within miles of me so *faute de mieux* I was obliged to put another shot into it."

"On the same day I had another most unusual bit of luck, getting again two birds out of one flock. I had had my first shot and dropped my bird at about 100 yards distance when the others, instead of at once taking to flight, actually paused long enough for me to get a second successful shot. My fifth bird was got in the middle of the day as we were returning to our starting point for we came suddenly on it over the crest of a hill, and as its back was towards us I was enabled to drop down and crawl up the hill and then kill it with an easy shot at less than forty yards."

It is probable that this Bustard is not as common now as it used to be some 50 years ago when Jerdon wrote his "Birds of India" for I doubt if it would be possible for any sportsman to emulate the gentleman mentioned therein who "killed above one

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

thousand Bustards with his rifle." At the same time we must remember that those were the days when tigers averaged 12 feet and it was a poor shot who could not get his brace or two before *chota hazri*.

Its area of habitat as given by Jerdon is much the same now as it was then and such notes as I have had sent me shew that their numbers have not much changed in any particular place during the last 25 years. Thus in 1879 Hume quotes Mr. G. Vidal as saying "This species is found very sparingly in the Eastern districts of the Poona and Satara Zillas." He then goes on to say that he only saw three specimens in five years in Satara, but that in Poona there are two or three places where they may be found yearly. After this Hume quotes Davidson as reporting it to be becoming yearly rarer in these parts. So that having been so scarce 32 years ago we should now expect it to be exterminated yet Lieut. E. G. Phythian Adams, of the 80th Infantry, writing in May 1910, informs me he knows "of its existence in the following districts: Satara, Poona, Sholapur, where it is uncommon."

Col. L. L. Fenton, I should note, says that "some thirty years ago Bustard were fairly common in the Sholapur District where they used to breed. I have also shot them in the Rabinnur Taluka of the Dharwar District. A few, I also came across in the Naladgi, now Bijapur District."

Mr. J. E. James reported it as common in Hume's time in Khandeish and Nasik and all my correspondents in that part of India say that it is so still.

From the Deccan reports are conflicting, but my correspondents who have gone most carefully into the matter tell me that the number of birds differ greatly in different years and one writer adds that it is quite possible for a sportsman who does not know the district to be there a year and leave with the impression that the Bustard is but a rare straggler therein, whereas the man who has lived some years in the Deccan and knows exactly when and where to look for these grand birds may consider them almost common.

On the whole, therefore, we may hope that our finest Indian Game bird is not on its way to extinction and that its wariness

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

combined with its open habitat may enable it to survive any persecution it has, or may have, to endure. At the same time the Great Indian Bustard requires protection just as much as our other Game birds do, for it is much sought after by snarers and bird catchers. I have had several letters from correspondents describing the way these birds are noosed in all districts and all Provinces. The principal way in which they are caught is that described by Hume, who writes "In parts of the Punjab, and doubtless elsewhere, the native fowlers are very expert in noosing them. A small party is described in the middle of a plain. The fowler, with a blanket folded over head and shoulders, native fashion, (or at times driving a trained bullock before him) and a large supply of pegs and gut nooses at his girdle, circles slowly approaching nearer and nearer, round the flock. By little indications inappreciable to us, he discovers the directions in which if slightly and cautiously pressed, the Bustards will walk. Across the line of march, sauntering slowly backwards and forwards, and pretending to cut and collect grass the while, the fowler pegs down rows of nooses. Then, taking a wider circuit, he begins to approach the flock from the opposite side not walking at them, but sideways, at right angles to the line he wishes them to take, passing nearer and nearer at each lap, never in the least alarming them, but quietly edging and pressing them towards the nooses. Sometimes he lets them walk right on to the nooses; generally when close to them, he drops his blanket, throws up his arms, and rushes at them. They always in these cases run a few paces before they rise, and though occasionally all escape, generally one, often two, and sometimes three or four, are caught by one or other leg. The chief skill consists in walking them exactly across the lines of nooses, which are never, according to my experience, more than fifty yards long, and usually much less."

As will be seen by Jerdon's description this bird is practically omnivorous; but to the items of diet mentioned by him must be added rats, mice and similar small animals, young birds and much vegetable matter, such as the shoots of young mustard, young wheat, lemon grass, etc.

Two or three writers to me have mentioned this Bustard's

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

curious taste for snakes and the natives generally give it credit for being a constant slayer and devourer of those reptiles.

As regards the breeding season of *Eupodotis edwardsi* it is not easy to lay down any very definite period. Hume says: "The Great Indian Bustard in Upper India lays mostly in July and August, but the breeding season varies a good deal according to the rainfall, and we have found eggs as early as the first half of March, and as late as the first half of September. In Southern India, according to Jerdon, they lay during the cold season.

"The eggs are placed on the ground, at the base of some bush or tuft of grass, in a small depression, generally unlined, often thinly lined with a few straggling blades of grass. The situation varies; sometimes the nest is in an open waste, sparsely dotted with a few herbaceous shrubs, often in the stubble of the giant and bulrush millets, and still more often in clumps and patches of high thatching grass, or the dense soft lemon grass so characteristic of the favourite haunts alike of this Bustard and the Houbara.

"My impression is, that the birds lay only one egg. But sometimes two eggs are found pretty close together, and either the females not unfrequently lay very close to each other, or when a female does lay more than one egg, she deposits the second some little distance from the first. Khan Nizam-ud-din Khan has taken more than a hundred of these eggs with his own hand, and he never found two eggs side by side. Where, as not unfrequently happens, two are within a yard or two of each other, he believes that they belong to different birds, and that this is a fact he has in one or two cases proved by snaring both females. I have only myself seen five nests, each containing a single egg. I can, therefore, say nothing positive on this subject.

"The eggs vary very much in size and shape. They are all more or less oval, but while some are moderately broad and slightly pointed at one end, others are long ovals, exactly similar at both ends, and others again are long and cylindrical, of the same size and shape as the egg of the great Northern Diver, figured by Mr. Hewitson; and I have one specimen that, both in colour, shape and size, might have been the one from which his plate of the egg of the European Bustard was taken. The shells

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

are very thick and strong, closely resembling those of the Sarus in texture, and like those of this latter species, the eggs very commonly exhibit pimples and rugosities at the large end, so much so that, out of sixty eggs now before me, only seven are perfectly free from such imperfections. Some of the eggs are dull and with little gloss, the whole surface being closely pitted with small pores similar to, but fewer than, those in the Peafowl's egg, while other specimens are brilliantly glossy. The ground colour varies much. Typically it is a sort of drab colour, but it is often earthy brown, dingy olive green, pale olive brown, pale reddish brown, and, although rarely, even pale leaden blue. The markings vary in extent, number and intensity; sometimes they are pretty deep reddish brown and clearly marked blotches, but more usually they are pale reddish brown clouds and streaks, sometimes so faint as to be mere mottlings, and sometimes, though rarely, altogether wanting. Occasionally, the markings form an irregular blotchy cap at the large end.

"Out of sixty eggs in my collection, no two are precisely alike. In length they vary from 2·75 to 3·42 and in breadth from 2·05 to 2·45, but the average of sixty eggs is 3·11 by 2·24."

I have in my collection a very fine series of eggs of this species taken by Mr. Harrington Bulkley and the times at which these eggs were found extend considerably the period given, as above, by Hume. The majority were taken in August and September, but many were taken in October and one in November. On the other hand I have three Deccan eggs taken in June and an egg from Cutch taken in January. Then I have records of eggs from Poona in April; Sholapur, April and May; and Guzerat, June and November. I have, therefore, eggs actually in my collection, or authentic records of eggs, taken in every month of the year except December, February and March. I think we may say that, very roughly speaking, the Great Indian Bustard breeds principally from August to November, but that many birds breed earlier and later than this, and that the breeding season varies very much in different localities, these not necessarily very far apart.

As to the number of eggs laid there is little to add to what Hume has noted. Undoubtedly the number normally laid is only

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

one and the exception to this rule is of the rarest. I have, however, in my collection one pair of eggs which are said to be from the same bird, but even here I must record the fact that they were found about a foot apart, in the same small beaten down patch in a field of lemon grass. The two eggs are of the rich brown variety and are so exactly like one another in every detail that it seems probable that they are a pair.

My eggs, though the series is much smaller than Humes, have a rather larger range of variation in colour, doubtless because Mr. Harrington Bulkley's series represents the variations picked out of a very much greater number which passed through his hands. Hume calls his eggs in ground colour *typically* a drab: I should call mine *typically* dull pale reddish brown, certainly in five out of six brown is the dominant colour of the egg. I have one egg which is a unicoloured sienna brown, and it is only when held up to the light that the very faint markings can be seen. Many eggs are a stone grey or drab in general appearance, others are a yellowish stone colour or olive yellow, a few dingy olive green and one a beautiful pale sea green. The markings are as described by Hume, but I have none which could be said to be boldly marked.

The majority are very highly glossed and very few have no gloss at all. My longest egg is 3·71″ and my broadest 2·35″, whilst the shortest and most narrow are respectively 3·0″ and 3·11″ and the average of 45 measured is 3·21″ by 2·29,″ my eggs therefore averaging considerably larger than Humes.

Our Plate of *Eupodotis edwardsi* is an excellent one, but the colouration of the back in both male and female is too red and should be more of a sandy buff. It must also be noted that the white eye-brow, as shown in the female, is not a sex difference, but only an individual characteristic.

Genus *HOUBARA*.

In the species of the genus *Houbara* the sexes are alike, the female differing only from the male in being slightly smaller. It is distinguished from all other *Otididæ* by the presence of a curious crest which consists, not of a collection of feathers, either few or numerous

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

massed together, but of numerous isolated feathers, thinly webbed at the base and completely separated and independent of each other. There is a thick ruff of black and white feathers on either side of the neck, and the feathers of the lower neck are also lengthened.

The genus contains but two species, the one, *Houbara macqueenii*, inhabiting Central Asia and visiting Northern India in winter and, the second, *Houbara undulata*, inhabiting the countries surrounding the Mediterranean.

HOUBARA MACQUEENII.

Macqueen's Bustard.

Otis macqueenii.—Gray & Hardw., Ill. Ind. Zool., ii, p. c. 47; Hutton, J. A. S. Beng. xvi. p. 786; Blyth, Cat. B. M. As. Soc., p. 258; Gould, B. of Asia, vii, pl. 58; Hume, Ibis, 1868, p. 241; Blanford, East Persia, ii, p. 287; Heath, Jour. B. N. H. Soc., vi, p. 372.

Houbara macqueenii.—Jerdon.,B. of Ind., iii, p. 612; Stoliczka, J. A. S. Beng. xli, p. 258; Hume, Str. Feath. i, p. 227; Adam, ibid, p. 393; LeMes, ibid, iii, p. 379; Butler, ibid, iv, p. 9; Hume, ibid, p. 9; Butler, ibid, v., p. 231; Hume & Marsh, Game B. of Ind, i, p. 17; Hume, Str. Feath. vii, p. 67; id, ibid, viii, p. 3; Butler, Cat. B. of Sind, p. 56; Hume, Cat. No. 837; Doig, Str. Feath, ix, p. 281; Murray, Vert. Faun, Sind, p. 218; Barnes, Jour. Bom. Nat. His. Soc., vi, p. 12; id, B. of Bombay, p. 321; Sharpe, Cat. B. M., xxiii, p. 318; Blanford, Avi. B. I., iv, p. 197; Sharpe Hand.-L. B. M., i, p. 175; Oates, Eggs of B. M., i, p. 89; Finn, Indian Waders, p. 122; Oates, Game B. India, i, p. 405.

Eupodotis macqueenii.—Gray, Hand-L. B., iii, p. 9.

Vernacular names.—*Tilur*, Punjab; *Talur*, Sindhi; *Hobara* or *Obara*. P.

Description—Adult male.—Forehead, sides of the crown and whole upper plumage sandy-buff, very finely vermiculated with black, the general aspect being sandy; on the mantle and scapulars the black vermiculations form into fairly definite black bars across the feathers, but these are absent on the lower back and rump; crest of long, narrow feathers, white on the basal and black on the terminal halves; upper tail coverts like the mantle but more rufous. Tail sandy rufous, the vermiculations almost absent at the base but

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

increasing towards the tip where they are as numerous as on the back and a little coarser. Four broad bars of grey, the two apical bars darker, and becoming quite black on the two central feathers, similar in character to the black vermiculated bars on the back; all the rectrices, with the exception of the two central ones, tipped white.

The feathers on the nape are curiously downy and those in the centre are often without any vermiculations. Sides of the head whitish buff with black striæ; chin and throat buffy white; fore neck pale buff, finely vermiculated with black; on the upper breast the buff changes to a beautiful french grey and the vermiculations almost disappear; lower tail coverts buffy white, much splashed and marked with brown, this colour forming into well marked bars on the outer webs of the outermost feathers; remainder of lower parts white. Primaries black, the bases white and the outer webs buff, this colour being most pronounced on the first primary, the inner webs white for two-thirds of their length, outer secondaries the same but with no buff on the outer webs and with the tips white; inner secondaries like the scapulars; lesser wing coverts like the back, median coverts the same but albescent; greater coverts with broad, black sub-terminal bars and white tips; winglet black.

Both males and females have a ruff of feathers starting from the sides of the neck and, to some extent, from the hind neck, the latter are sparse and thin, mixed black and white but with the former predominating; the feathers at the sides form two long tufts, the inner are white on the basal halves and black on the terminal halves which are much broader; outside these the feathers are white, of the same breadth throughout and generally longer than the broader black feathers, here and there may be seen a few faint bars of grey or specks of black. The feathers of the sides of the breast are very full and long forming a continuation of the ruff.

The feathers of the crest may measure as much as 3·2″ in length whilst the longer feathers of the ruff are sometimes well over 7″ and those of the breast up to, or even over, 3″.

In old birds the grey on the breast appears to become purer and more extensive whilst the vermiculations become fewer and fewer.

"The irides vary from pale to bright yellow.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"The legs and feet are pale yellow, never clear and bright, mostly with a dingy or greenish, or plumbeous tinge, at times creamy; the bill is blackish or dusky above, paler, usually greenish or yellowish on gape and lower mandible.

"Length, 28 to 30·25; expanse 51·5 to 57·75; wing 15 to 16·1; tail from vent 8·5 to 10·25; tarsus 3·4 to 3·9; bill from gape 2·3 to 2·4. Weight 4 to 5¼ lbs." (Hume).

The measurements of the few males I have measured have been as follows: wing 14·3″ to 16·2″, tail 8·5″ to 9·5″; bill, culmen 1·35″ to 1·5″ and from gape 2·1″ to 2·35″; mid toe 1·65″ to 2·0″.

Sharpe gives the measurements as "Total length about 28 inches, culmen 1·8, wing 15·7, tail 9·5, tarsus 4·9." These measurements are very curious as he makes out the female to be a much smaller bird, yet gives a longer wing measurement for the female than for the male. The measurement given for the tarsus 4·9 is probably a slip or misprint for 3·9.

Adult female.—"Differs from the male in being very much smaller and in having the crest and the ruff of the neck more feebly developed, the freckling on the foreneck and lower throat appearing to be rather coarser than in the male. Total length 23 inches, culmen 1·65; wing 16; tail 7; tarsus 3·7." (Sharpe).

My measurements for the female are as follows: wing 13·5″ to 15·0″; bill from front on culmen 1·2″ to 1·35″ and from gape 1·8″ to 2·2″; mid toe 1·56″ to 1·85″.

Hume records the measurement as "Length 25 to 27·5; expanse 47 to 51; wing 14·25 to 15·25; tail from vent 7·75 to 9·25; 3·15 to 3·6; bill from gape 2·0 to 2·5; weight 2 lbs. 10 ozs. to 3 lbs. 12 ozs."

Young birds.—"Can always be recognized from the adult female which they most resemble, by the sandy coloured arrow head markings which pervade the whole of the upper plumage. The frill is always very small, the crest on the head is represented only by a few elongated feathers, which are only recognized by somewhat coarser black freckling and the white of the primaries is distinctly inclined to sandy buff; in some specimens there is an indication of a black band on the feathers of the fore neck." (Sharpe).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Distribution.—The Houbara is, so far as is yet known, only a cold weather visitant to the Plains of India, being found throughout the Punjab, Rajputana, Sind, Cutch and Northern Guzerat. Oates defines its Eastern limit as a line drawn from Delhi on the Jumna River to Baroda, but Hume has recorded having shot one himself in the Meerut District, east of the Jamna and doubtless other occasional birds will be met with as far East as this bird.

Outside India it is found in West Central Asia as far West as Mesopotamia, whence it straggles commonly into South-Eastern Europe and more rarely into Northern and Western Europe, as far as the British Isles, Persia, Central Asia, as far South as Afghanistan and Baluchistan (throughout the year) and the highlands of West and North-West China, breeding as close to Indian limits as the Persian Gulf and Afghanistan and Baluchistan.

The fact that our Indian Houbara has been so much confounded with the African bird, *Houbara undulata*, has prevented many persons from collecting specimens of the Houbara when met with on the border lands of the two species and the dividing line between the two has not yet been satisfactorily worked out. The B. M. possesses so few specimens of either sort, except, for those Indian killed specimens of *Houbara macqueenii* in the Hume collection, that they do not much help in this respect.

Dresser, in his "Palæartic Birds" gives the habitat of our bird as "N.-W. India, Afghanistan, Persia, Central Asia; a rare straggler to Europe and has been met with in Germany, Poland, Finland, Oland, Belgium, Holland and four times in Great Britain." The African Houbara he gives as extending to Palestine and Armenia.

The Houbara arrives in India as early as the end of August. Hume records the shooting of one on the 27th of August and Butler records the arrival on the 30th of that month. The latter however, says: "The end of August is exceptionally early for their arrival. The main body do not appear until about the first week in October. A few pairs were breeding at Henjam, Persian Gulf, at the beginning of April, 1877." Butler's record refers to Northern Guzerat and in the Northern Punjab they are reported to arrive at much the same time; a few stragglers appear in early September

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but not many are to be found until very late in that month or early in October.

Their departure takes place in March and early April, though Doig's men reported their still being in the Eastern Nara, Sind, in May and June. Doig also adds that "a man voluntarily informed me one day that he had seen the eggs of the *Tilloor* in the desert at a place near where my man had seen the birds."

Major A. R. Burton informs me that in the Zhob Valley and the Loralai District they are found from September to March.

This Bustard, like the others of the order, is more or less gregarious, but never seems to collect in very large flocks. Hume states that he has put up as many as twenty birds in a flock, but most of my correspondents speak of seeing small flocks of three to five or six and I have received no information of flocks as large as that seen by Hume. Major Burton, in his letter above referred to, says that the birds were fairly plentiful in the Zhob Valley, but that he never put up more than eight birds in a flock. On the other hand birds are found very often either in pairs or alone.

Hume was very successful in shooting this Bustard and he records, in "Game Birds," that in 1867 he killed no less than 83 birds, 47 cocks and 36 hens, in one week in November. He writes in his usual interesting manner on the easiest way to obtain this bird. He says: "The Houbara greatly prefers running to flying, and when the weather is not too hot, will make its way through the labyrinth of little bushes which constitute its home at a really surprising pace. So long as the cover is low, its neck and body are held as low as possible, but as soon as it gets where it thinks it cannot be seen, it pulls up, and raising its head as high as possible, takes a good look at its pursuers. Not unfrequently it then concludes to squat, and though you may have been, unobserved, watching it carefully whilst it was only watching others of the party coming from an opposite direction, it becomes absolutely invisible the moment it settles down at the foot of a bush or stone. Once it has thus settled, especially if it is hot and about noon, you may walk past it within ten yards without flushing it, if you walk carelessly and keep looking in another direction.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

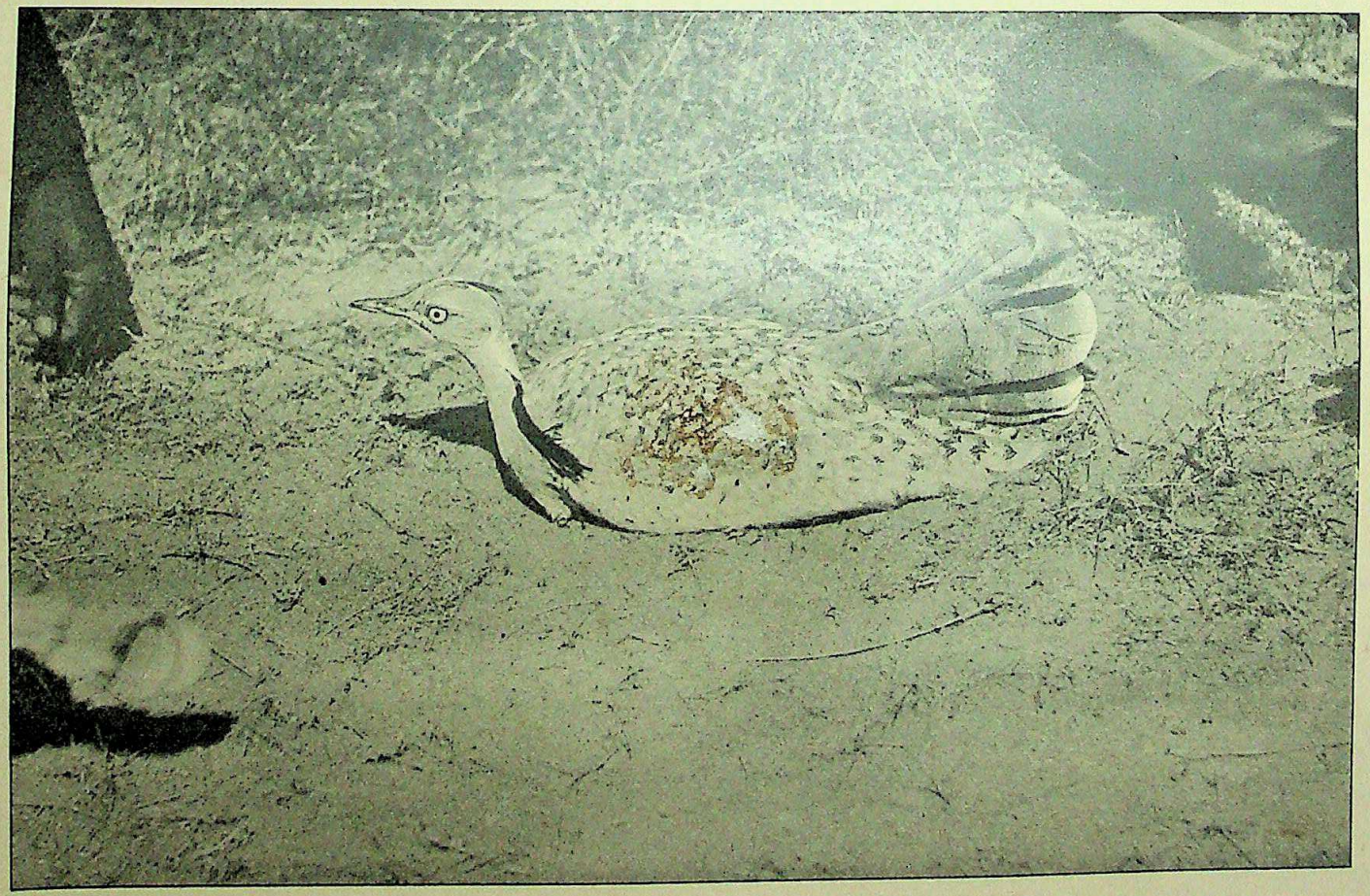
Digitized by Arya Samaj Foundation Chennai and eGangotri

"But it is weary work trudging on foot under an Indian sun after birds that run as these can and will, and in the districts where they are plentiful, people always either hawk them or shoot them from camels.

"Off a camel a large bag is easily made, and as, whilst after these Bustards, you get from time to time shots at Antelope or Ravine-deer, Quail, Partridges, and on rare occasions, a Great Bustard also, it is not bad fun, though rather monotonous, like the scenery that surrounds one.

"Taking the camel at a long, easy, six-miles-an-hour trot, across one of those vast wildernesses they affect, you will not be long before raised high up as you are on camel back, you catch sight of one or more Houbara feeding amongst the bushes. To them camels have no evil import; everybody uses them; none but the veriest pauper walks, every one rides, and rides camels. The peasant going out to plough his field rides on one camel and puts his plough on the other, which, with its nose-string fastened to the tail of the one he rides, trots along complacently behind. When, therefore, the Houbara see you coming along on a camel, they only move a little aside, so as to be out of your line of march, and you at once begin to describe a large spiral round them, so that, while appearing always to be passing away from them, you are really always closing in on them. Sometimes, if the time be early or late, or if the day be cold or cloudy, long before you are within shot, they start off running, and if you press them further, ultimately take wing, flying heavily, and soon re-alighting and running on, never, so far as I have seen, taking the long flights that the Great Bustard does, and never fluttering and skylarking in the air as do the little ones. Generally, however, if the time be between 10 and 4, and the day bright and warm, as your spiral diminishes the birds disappear suddenly. They have squatted. Still you go on round and round, closing in in each lap, and straining your eyes, usually in vain, to discover their whereabouts; suddenly perhaps from under the very feet of the camel, up flutters one of the birds, and after a few strides, rises, to fall dead a few yards futher on, as they are easy to hit and easy to kill. Of course, I suppose a trained camel to be used,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



THE HOUBARA (*Houbara macqueeni*).

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

otherwise, what with flies, keeping up a perpetual twitching of every part of the beast's head, neck and body and its natural suspicions that you and your gun are up to no good, you will find it by no means difficult to miss even a Houbara, especially if you do not remember always so to slew your camel round as to have the bird well on your left side.

"At the first shot, all the Houbara that are at all close usually rise, but after shooting a brace right and left, and having them picked up and slung I have known a third blunder up from within a few yards.

"Often, especially when you are out alone, and after breaking up a large flock (which it is always best to do) are working a single bird, you close in, and in until you reach the very bush by which you last saw it, and yet can find no trace of it. You pull up, as this generally starts the birds, but sometimes even then nothing is to be seen. The way they will squat at times on an absolutely bare patch of sand is astonishing; their plumage harmonizes perfectly with the soil, and you will have a bird rise suddenly, apparently out of the earth, within five yards of you, from a spot where there is not a blade to cover, and on which your eyes have perhaps been fixed for some seconds. This is especially the case about mid-day, when the sun is nearly vertical and no shadow is thrown by the squatting bird. Sometimes they try another plan; they get behind a single bush, and, as you circle round, they do the same, always keeping the bush between themselves and the sportsman; here, unless the sun is quite vertical, their shadow projected on the ground, apart from that of the bush, is sure, at certain positions in the circle to betray them, and a shot through the bush brings them to bag.

"In some parts of the country the Houbara greatly affect fields of mustard and other crops yielding the oil-seeds of commerce, of which there is a vast variety, known by half a dozen different names, in almost every province.

"When these fields are well grown, and are, say, a little higher than the bird itself stands, exceptionally good sport may at times be obtained.

"They cannot run here, the growth is too dense, and a line of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

guns and beaters, sweeping a large field of this kind into which a flock has been marked, will often account for the whole party flushing them like so many Pheasants out of a dense turnip field, with buckwheat lines, along a cover side."

Mr. M. M. Currie has sent me the following interesting note on the occurrence of the Houbara in Ludhiana and Dhera Ismail Khan. "Bustard,"—*i.e.*, the Lesser Bustard or Obara, commonly called "Tilur" in the Punjab, was pretty common in the Dhera Ghazi Khan where I shot a certain number in the cold weather of 1908-09. They were most common in the dry tract at the foot of the Salimans where they seemed to be especially fond of lying up in a kind of coarse grass locally known as Ghamm. Later in the year they haunt the fields sewn with oil-seeds (tara-mira). I have also seen them in the low-lands down by the Indus. The usual number seen together was three or four, but once or twice I have seen as many as a dozen together. The method of shooting most often employed is with camels. The sportsman dismounts and taking cover behind the camel, continues to approach in circles till within range when he advances towards the spot where the bird is lying till he puts it up.

"The best bag I ever saw made in this manner was by a companion of mine who got six birds one day, whilst I, not so fortunate, shot but one. It is said to be possible at times to walk them up in the oil seeds, but I never did so with any success."

It is perhaps quite as often hawked as shot, though naturally one does not expect to make as big bags in the former as in the latter way.

Major Drake Brockman thus describes a day Houbara hawking near Peshawar.

"Some of the pleasantest days I can remember having passed in India were spent at Peshawar in the cold weather of 1893 and 1894.

"Apart from the excellent pack of hounds there and the good sport we had I think that even more pleasant days were those we spent out hawking Houbara on the Jamrud Plain in the company of Mr. Donald, Asst. Commr., and Colonel Aslam Khan, of the Khyber Rifles.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"The Jamrud Plain, a few miles out of Peshawar is covered, to some extent, with low sparse scrub jungle and small boulders intersected with numerous dry water courses, mostly small, but some of a considerable width. The road runs right through this plain and on either side the latter stretches away to the foot of the hills, where far away—about 10 miles distant—can be seen Fort Jamrud, situated at the mouth of the famous Khyber Pass."

"After an early breakfast we would drive out in the keen morning air to our rendezvous, some five miles or so out on the Jamrud road, to which our ponies had already been sent on ahead to wait for us. Here also Col. Aslam Khan would generally wait for us, together with a few men of the Khyber Rifles, to act as an armed escort party and also to be extended in line on either side of us so that they might act as beaters.

"Having mounted our ponies we would strike off across the Plain in the direction of the Minitini Fort, the men with the Falcons—they were Peregrines we usually used for this sport—on either side of us, and the remaining sepoys extended as I have said.

"After going in this manner for perhaps the best part of a mile, sometimes much less, up would get a Houbara, generally about 80 yards or so in front of our line. Immediately he was spotted one of the falcons was unhooded and thrown off, and as soon as he sighted the Houbara a grand race would begin. The Peregrine, like an arrow from the bow, would hurl itself in pursuit of its quarry and we would hasten after both, galloping for all we were worth, and galloping across the boulder strewn and broken plain was exciting enough in itself, though it was wonderful the way our little country-bred ponies kept their feet and got over the ground."

"Ride, however, as hard and as recklessly as we could, the two birds would leave us soon behind, although the Houbara with the steady beats of the wing seemed to be going comparatively slowly,"

"At last the Falcon would be within striking distance of the Houbara, there would be one lightning-like swoop from the former from far above, and then, if he struck true the tragedy was over for the Bustard, and riding up we would find them in some small open

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

place and the Houbara dead, the hawk still grasping it on the ground. The men would then come up and secure the Falcon, give it a tit-bit to eat and then hood it again."

"Remounting our ponies and once more extending our line we would go on in the same way and, if luck favoured us, might perhaps get another Houbara. Not every time, however, were we successful, for sometimes the Houbara would succeed in eluding the hawk once and yet again, sometimes, indeed, escaping altogether."

"By the time we had worked across the plain our appetites would remind us that it was time for lunch so, having selected a suitable spot with some shade if possible, we would dismount and partake of the good cold fowl and Pathan *roti* provided for us all by Col. Aslam Khan."

"But the winter days soon close in, even in this land of sun, and, after we had rested, a glimpse at the Western sky showed us that if we wanted any sport *en route* it was time we once more got into our saddles. Accordingly, mounted once more, we would continue to beat back to the place where we had ordered our traps to wait for us. If our luck was still in the ascendant we might get another run or rather flight, but we generally considered that two birds in a day was a good day's average. Arrived at the road we would say good-bye to Col. Aslam Khan and drive homeward, well wrapped up, for the winters in Peshawar are very cold, pleasantly tired after a delightful day in the most perfect winter climate in Northern India."

"I am sorry to say that owing to the swift flight of Houbara and Hawk we were never up quite in time to see exactly what happened at the kill or to see the hawk actually striking the Houbara. There seemed to be always a lot of feathers about, and it looked as if there might have been a bit of a tussle between the two, but they might also merely have been knocked out of the Houbara from the force with which, when struck by the falcon, it fell to the ground. We noticed, too, that the Houbara always seemed to emit some secretion for there was generally a mess of this around."

Mr. F. J. Mitchell *in epistola* also mentions this curious habit of the Houbara. He writes "the Houbara when pursued often rises

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

like a Heron under similar circumstances. If he can get immediately over the pursuing hawk he squirts him with a stinking gummy (anal) liquid which sticks the hawks feathers together so that he cannot fly. Sometimes the hawk falls like a stone when thus squirted and he has to be washed with warm water before he can fly again."

This habit seems to be common to the members of this family most of which pass this offensive fluid when attacked or wounded.

Hume says that sometimes very large bags of Houbara are made, and that in Pairi District in favourable years "any man could shoot twenty in a day," and General Marsten, while Superintendent of Police in the Kurrachee District, shot, I believe, forty-eight (and some people say fifty-eight) on one occasion."

As regards the food of the Bustard there is little to add to what Hume has recorded. They are more or less omnivorous, as are the other birds of this family, but they are far more vegetarian in their diet and are not nearly as gross feeders as the larger species. They will, when driven to it by stress of hunger, sometimes eat small reptiles, etc., but they do *not* eat these in *preference* to green food, and they are very partial to young wheat and similar crops and are said sometimes to cause considerable injury to such crops in the Punjab.

Their flight is more like *Otis tarda* and *Eupodotis edwardsi* than like *Otis tetrax* or the Floricans. They progress by slow steady beats of the wing and cover the ground at a very good pace, and when being hawked turn, twist, or drop to the ground with wonderful rapidity. As a rule they run before taking to wing but can take to flight quite easily without any preliminary walk, and when flushed in thick crops rise like pheasants and are then easily shot.

The Houbara breeds in Afghanistan, Baluchistan, Persia and the Persian Gulf. It has never yet been found breeding actually within Indian limits, but it is quite possible it may yet be found to breed occasionally in Sind. H. E. Barnes records: "I feel sure that a few at least remain to breed, both in Sind and Cutch; a friend of mine avers that he has seen eggs in the latter place, but as he did not preserve them, he may have made a mistake, but he is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

too good a sportsman not to know a Houbara when he sees one. Mr. Doig had excellent reasons for believing that the Houbara bred in the desert between Godra and Renahoe." Barnes then refers to Col. Butler's remarks in Str. Feathers, which are as follows: "Mr. Scroggie, however, who resides at Henjam, imparted an important piece of information which I must not omit, and that is that one or two pairs of *Houbara macqueeni* were breeding in the Island and that about six weeks before our arrival, *i.e.*, about the first week in April, a pair (♂ & ♀) were shot there, and that he extracted a perfect egg from the oviduct of the female and put it under a hen to hatch, but that subsequently it was destroyed by rats. I am inclined to think that the greater number of Houbara that visit Sind in the cold weather breed in Persia and Afghanistan."

The nest, which is merely a depression in the sand or earth, seems generally to be placed in the open though under shelter of some scrubby bush or patch of grass, failing these, in amongst stones or boulders.

The eggs seem to be three in number in a full clutch though sometimes two only may be laid. Oates thus describes the egg of this species in the British Museum: "The eggs of the Indian Houbara are elliptical in form and possess very little gloss. The ground colour varies from stone colour to dull olive-brown, and the markings are more distinct than is usually the case with eggs of the Bustards. They consist of spots and blotches of rather dark brown and pale underlying purple, very evenly distributed over the whole shell. Specimens measure from 2·3 to 2·55 in length, and from 1·65 to 1·85 in breadth."

Eggs in my own collection answer the above description well, but I have one clutch of three from the Altai which has the ground colour a very distinct olive-green, indeed, they are the greenest eggs I have in my collection of any Bustard. The markings are rather indefinite as a rule and even the darkest are often somewhat smudgy in character.

The eggs in the British Museum are dated 25th April, Euphrates Valley, and 15th May and June from Altai Mountains. Eggs in my own collection from the latter place are dated 12th June

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and 24th June and from Afghanistan the 22nd April. Their breeding season would seem to range therefore from very early in April to the middle of June.

Our coloured Plate of this bird is both beautiful and correct. The attitude shown thereon is a semi-courting one; when the bird reaches the full frenzy of his passion the tail is thrown back well over the back and the wings are trailed until they touch the ground, and in some cases the ends of the feathers are elevated and the shoulders depressed whilst the wings are forced outwards so as to form a sort of screen extending on either side of the breast.

The collar on the breast of the bird in the picture is almost absent and generally shews a good deal more than this.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SOME NEW INDIAN RODENTS

BY

R. C. WROUGHTON, F.Z.S.

(With a Plate.)

In working out the specimens collected by the Society's Mammal Survey I have found two animals which are unnamed, *viz.*—a hare from Khandesh and a most interesting long-tailed mouse, which I can refer to no known Genus. Further in the course of comparison I have found, in the National Collection, series of specimens closely related to the common Indian Field-Mouse (*L. ooduga*) which require a name. This paper deals with the descriptions of these three species.

LEPUS SIMCOXI, sp. n.

The Khandesh Hare.

A hare about the size of *nigricollis* and *ruficaudatus*, distinguishable at sight by its smoke grey nape.

General colour above pinkish buff, much mixed with black, individual hairs of the middle back white at base (10 mm.) followed by a dusky ring (4 mm.), remainder (9-10 mm.) pinkish buff with a short black tip; below pure white; on the lower back all buffy colouring disappears and the hairs are greyish white with black tips. Face coloured like the back, cheeks and chin and commencement of throat pure white, lower throat dark buffy. Ears drab. Limbs outwardly pinkish-buff. Nape grey. Tail above blue-black with only the slightest buffy tinge, below pure white.

I can detect no important constant difference between the skulls of *nigricollis*, *ruficaudatus* and the present species. The nasals in the present species are narrow and equally broad in their whole length, but being laterally bent downwards, anteriorly, give the idea of a sharp pointed muzzle.

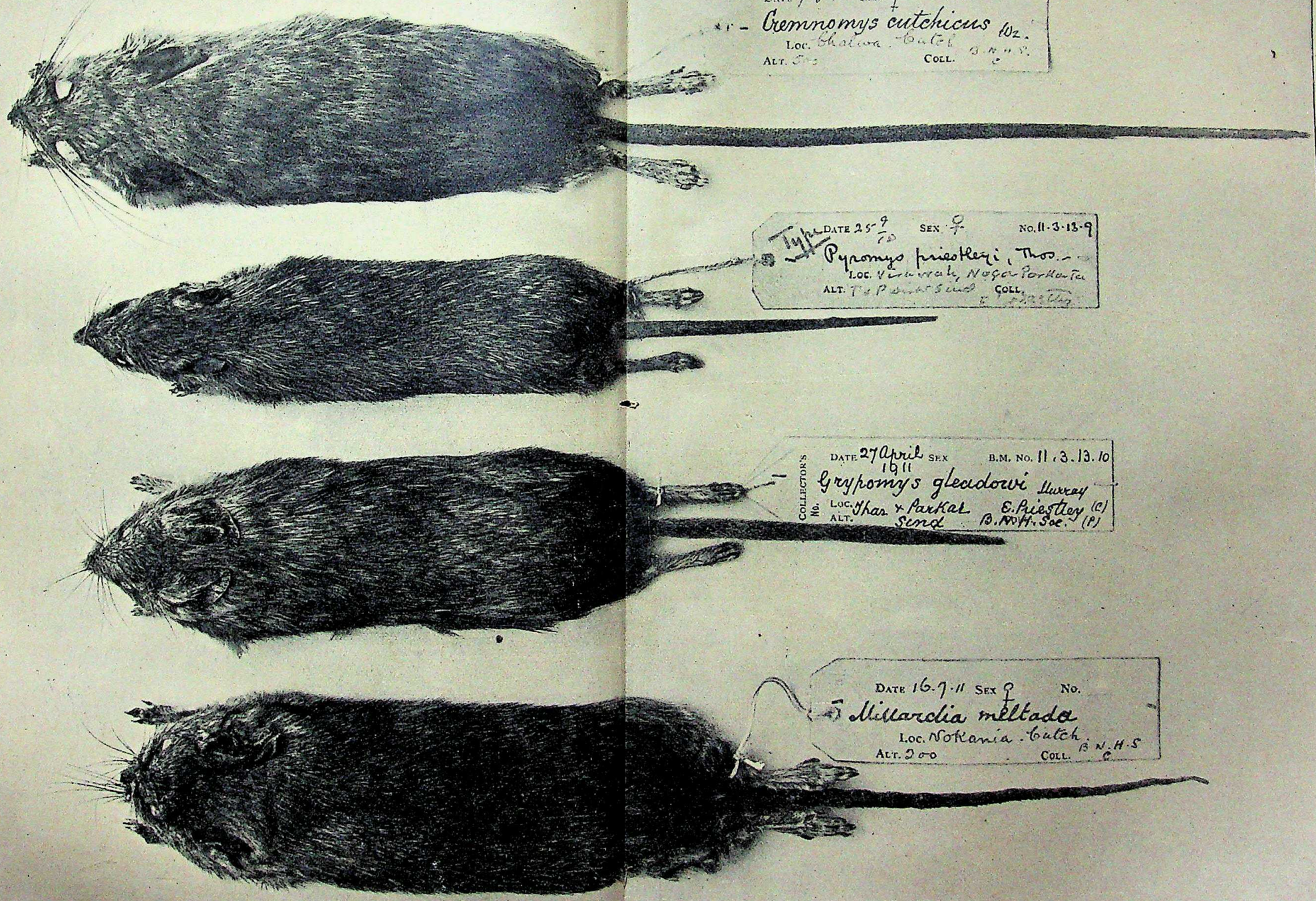
Dimensions of the type (recorded by the Collector).—Head and body 480; tail 89; hind foot 112; ear 105. Skull: greatest length 94; basal length 76; zygomatic breadth 40; greatest length of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nasals 38; posterior breadth of nasals 19; apparent width of nasals anteriorly 12; palatal foramen 23; diastema 28; upper molar series 16.

Hab.—Khandesh (Type from Edalabad.) Alt. 1,000 ft.

Type.—Adult female, B.M. No. 11, 8, 7, 1. Original number 99. Collected by Mr. Crump, 22nd April 1911, and presented to the National Collection by the Bombay Natural History Society.

The material available for comparison with *ruficaudatus* is very meagre. In the original description of the type from 'Bengal' Is. Geoffroy describes the nape as 'roux'. All Hodgson's Nepal and Sikkim specimens have a buff nape, and Jerdon describes the nape of the hare of Bengal as "pale sandy rufescent;" that of *nigricollis* is black, so that this character alone suffices to distinguish *simcoxi* from other hares of the Indian Plains. It is encouraging to find this quite distinct new species in the first collection of the Society's "Mammal Survey," and I have much pleasure in naming it after Mr. A. H. A. Simcox, I.C.S., Collector of Khandesh, who took so much interest in the work of our Collector in his District.

LEGGADA DUNNI, sp. n.

The Northern Field-Mouse.

A *Leggada* smaller than *booduga* and markedly differing from that species by its paler drab colouration.

General colour above drab, individual hairs slate-grey for basal two-thirds of length, remaining one-third buff; below white, in some specimens the belly is pure white, but in the majority including the type, the hairs have short grey bases. Face like back. Tail above like back, paler below. Hands and feet white.

Skull short and broad, as compared with that of *booduga*, the anterior cusp or ridge on the front of first molar, characteristic of *Leggada*, plainly marked.

Dimensions of type:—head and body 58; tail 60; hind foot 12; ear 11. Skull: greatest length 18·5 (20); basilar length 15 (16); greatest breadth 9·5 (10); nasals 7 (7·6); interorbital breadth 3 (3·4); braincase breadth 8·6 (8·5); diastema 5·3 (6); palatal foramina 4 (5); molars 3 (3).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(*Note*—The figures in brackets are taken from the skull of an old female obtained by myself at Dharwar and consequently a topotype of *booduga.*)

Hab:—Punjab (Type from Ambala.) Alt. 900 ft.

Type:—Old male. B. M. No. 9, 4, 6, 36. Collected 1st January 1909, by Major H. N. Dunn, R.A.M.C., and presented to the British Museum. Seven specimens were sent by Major Dunn, from Ambala, a very even series. The British Museum has also two specimens collected by Major E. J. F. Birrell, R.A.M.C., at Rawalpindi, both these are young individuals, they must be placed in this species. In the Cutch Collection of the B. N. H. Society's Mammal Survey a single specimen was obtained, which is also *L. dunni.*

CREMNOMYS, gen. nov.

Sole pads 6, sixth, or proximal, elongate as in *Epimys.* Fifth hind toe long, reaching to the end of the first phalanx of the fourth. Mammæ 1-2=6.

Skull rather flat; braincase broad, narrowing suddenly anteriorly; bony palate not produced posteriorly behind 3rd upper molar, mesopterygoid fossa with sub-parallel margins. Molars as in *Millardia.*

Type:—*Cremnomys cutchicus.*

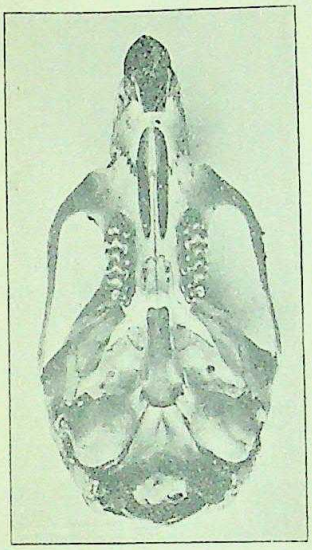
Mr. Thomas recently described in this Journal (XX. p. 996) a group of three closely allied genera, *viz.*—*Millardia, Pyromys* and *Grypomys.* The present is a fourth member of this group. The following comparative table gives at a glance the principal distinguishing characters of each:—

	Millardia.	*Pyromys.*	*Grypomys.*	*Cremnomys.*
Pads of hind foot ..	5	6	4	6
Fifth toe of hind foot	short.	long.	short.	long.
Tail	medium.	short.	short.	long.
Mamm. Formula ..	2-2=8	4-2=12	1-2=6	1-2=6
Profile of skull ..	normal.	arched.	normal.	flat.
Bony palate ..	normal.	produced backwards.	produced backwards.	normal.
Mesopterygoid fossa	normal.	narrowed.	narrowed.	normal.
Upper molars ..	normal.	normal.	3rd molar modified.	normal.

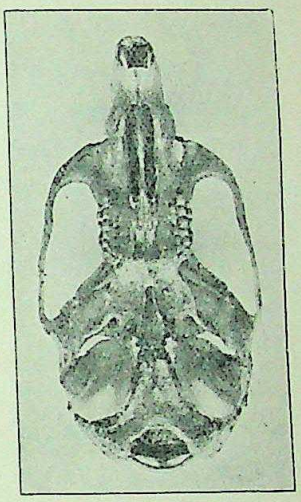
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The following figures show the two characteristic types of palate formation in this group of Genera (for details *see* table above). The figures are double natural size.



CREMNOMYS CUTCHICUS, *Wroughton.*



GRYPOMYS GLEADOWI, *Murray.*

I have used, above, the expression "bony palate produced backwards" as a convenient description of the formation referred to, it is, however, not technically correct; the effect is not so produced but by the 'roofing in' of the posterior nares, by the partial drawing together of the margins of the mesopterygoid fossa.

The plate is intended to illustrate life-size, representatives of the four genera. Unfortunately Museum specimens, especially those prepared by amateurs, rarely reproduce exactly the natural size of the animal, the body skin being almost always stretched. In the present case *Millardia* and *Cremnomys* are only slightly too large, and the size of the others may be very fairly correctly deduced from the proportionate size of their feet.

CREMNOMYS CUTCHICUS, sp. n.

The Cutch Rock-Rat.

In size, fur, and colour resembling *Millardia meltada*, but at once distinguishable from that species by its remarkably long tail and long fifth hind toe.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Size about as in *Millardia*. Fur long, soft and silky. General colour above 'drab'; individual hairs dark slate-grey with buff tips (a considerable admixture of long all black hairs); below pure white; face and tail coloured like back; hands and feet pale.

Dimensions of the type:—head and body 117; tail 141; hind foot 24; ear 20.

Skull:—greatest length 33; basilar length 25; greatest breadth 15·5; braincase breadth 14; interorbital breadth 5; nasals 15; diastema 8·5; upper molars 6.

Hab:—Cutch.

Type:—old male, B. M. No. 11, 10, 18, 1. Collected on 20th July 1911 by Mr. Crump, and presented to the National Collection by the Bombay Natural History Society.

Mr. Crump obtained over a score of specimens of this fine new species. At first I was startled by the discovery of such a long tailed animal in a treeless country like Cutch, but Mr. Crump notes that the specimens were taken amongst rocks so the adaptation is to rock and not tree climbing. In reference to this I have chosen the Generic name from the Greek 'cremnos' meaning a rocky scarp. I have much pleasure in naming the species *cutchicus* in honour of H. H. the Rao Kenghaji of Cutch, who takes such a keen and intelligent interest in Zoology and who has specially interested himself in the Mammal Survey of the Society.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED.

BY

E. BLATTER, S.J.

PART VI.

(*With Plates XXVI—XXXII, and text-figures* 20—23).

(*Continued from page 86 of this Volume.*)

LIVISTONA, R. BR. PRODR. III. 123.

(When Richard Brown discovered this genus of majestic and graceful palms, he dedicated it to one of the great promotors of English horticulture, *viz.*, Patrick Murray, Baron of Livistone, the founder of the Botanic Garden of Edinburgh.)

Bl. Rumph. II, 48, t. 95, 96 (Saribus).—Jacq. Fragm. t. 11, fig. 1. (Latania).—Kunth Enum. Pl. III, 241.—Mart. Hist. Nat. Palm. III, 239, 319.—Griff. Palms Brit. Ind. 127, t. 226 A, B, C, D, append. 23.—Miq. Fl. Ind. Bat. III. 57, Suppl. 591—Becc. Males, I. 84.—Kurz. For. Fl. II, 525—Benth. Fl. Aurtr. VII, 145.—F. Muell. Fragm. Austral. VIII, 221—Wendl. & Drude Linn. 39. 192, 226.—Benth. & Hook. Gen. Pl. III, II. 929, 97.

Tall palms; trunk annulate. Leaves orbicular, flabellately plicate, split to about the middle into bifid narrow lobes; petiole long with spinous margins. Spathes many, tubular sheathing. Spadices interfoliar, long peduncled, erect, fruiting pendulous, loosely panicled. Flowers minute, hermaphrodite. Sepals 3, rounded, imbricate. Corolla 3-lobed, coriaceous, lobes valvate. Stamens 6; filaments subulate, united in a ring; anthers cordate. Ovary of 3 nearly free carpels; styles short, free or coherent; stigmas minute; ovules basilar, erect. Drupes 1-3,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

globose oblong or ellipsoid; style subterminal. Seed erect, ventral face hollowed; albumen equable; embryo dorsal.

Species about 17; Tropical Asia and Australia.

CULTIVATION IN EUROPE.—The species of Livistona are mostly stove palms. They grow best in a compost of two parts loam and one of peat, to which a little sand may be added. Much water is required throughout the summer. The seeds should be sown in sandy soil, and placed in a gentle bottom heat. Several species are admirably adapted for various decorative purposes, and especially for subtropical gardening.

* INDIGENOUS SPECIES.

LIVISTONA JENKINSIANA, Griff. in Calc. Journ. Nat. Hist. V, 334; Palms Brit. Ind. 128, t. 226 A & B; Hook. Fl. Brit. Ind. VI, 435; Brandis Ind. Trees 656.

NAME.—Toko Pat (Ass.).

DESCRIPTION.—Trunk 20-30 feet high. 6-7 inches in diameter, rough towards the apex from the adhering bases of the petioles, with a thick, round crown. Leaves 6-7 feet long, reniform flabelliform, greatest breadth 5-6 feet, length from the apex of the petiole 3-3½ feet, divided into about 70-80, obtuse, bilobed segments, of which the extreme lateral ones are the deepest, being 18 inches long, while the central ones are scarcely half that length, undersurface glaucous cæsious. Petiole channelled above, armed almost to the summit; ligule cordate. Spadices 2-3 feet long, axillary; branches a span or a foot long, dichotomous opposite the ends of the spathes; lowermost branchlets 2-3 times divided, the other simple. Spathes chesnut-red, sometimes split, concealing the greater part of the peduncle, scurfy outside, the one next the first branch 1-1½ foot long, 3 or 5 keeled, with a large, oblong, deeply bilobed, split limb. Flowers small, several together, sessile or raised on small tubercles, greenish, ebracteate. Calyx short with a broad base, cup-shaped, with 3 short rounded teeth with membranous margins. Corolla about twice as long as the calyx, divided to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a short distance from the middle into 3 triangular segments. Stamens 6, united in a ring. Filament short, setaceous from a very dilated base. Anthers oblong, versatile. Pollen lanceolar with one fold. Ovary obconical, yellow, with a depressed, red spotted apex; carpels cohering by means of a short, trisulcate filiform style. Stigma simple. Ovule solitary, erect, anatropous. Drupe $\frac{3}{4}$-1 inch in diameter, reniform globose, slightly attenuate at the base, of a leaden blue colour, marked on one side with a depressed whitish line. Seed erect, presenting on the side corresponding with the above line on the fruit, a broad raphe-like line. Albumen horny, opposite the centre of the above line deeply excavated; cavity filled with a spongy substance. Embryo opposite the excavation or situated in the centre of the dorsal face.

HABITAT.—Upper Assam: Gubrow Purbut; common throughout Assam, but most plentiful in the Nowgong district; Naga Hills. Sikkim, lower hills and outer valleys.

USES.—"This palm is an indispensable accompaniment of every native gentleman's house, but in some parts it is rare, and the trees are then of great value. The leaves are in universal use throughout Assam for covering the tops of doolees (palanqueens), and the roofs of boats, also for making the peculiar hats, or rather umbrella-hats (jhapees) of the Assamese. For all these purposes the leaves are admirably adapted from their lightness, toughness, and durability." (Jenkins).

CULTIVATION IN EUROPE.—This palm is a beautiful greenhouse plant.

LIVISTONA SPECIOSA, Kurz in Journ. As. Soc. Beng. xliii, II, (1874), 196, 204, t. 13, 14; For. Fl. II, 526; Hook. Fl. Brit. Ind. VI, 435; Brandis, Ind. Trees 656.

NAMES.—Taung tan, Taw tan (Burm.)

DESCRIPTION.—Trunk 50-70 feet; all parts glabrous; leaves palmately flabellate, about 6-7 feet across each way, plaited; the petiole at the base up to an inch broad, armed with strong, sharp, falcately curved, flattish, blackish spines, the lower spines up to $\frac{1}{2}$ inch long and longer by 3-4 lines broad at the base; sheaths dividing

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

into netted fibres; leaflets all (the lateral ones up to half of their length, the central ones higher up) connate in a blade, linear, sharply 2-cleft at the apex, the ribs compressed, prominent, the veins rather visible and transverse. Flowers small, solitary, or by 2 on a nipple-like, very short and thick pedicel, racemose-spicate, forming a much-branched, smooth, panicle-shaped, 2-4 feet long spadix, furnished at the base and along the primary axis with large, fuscous, quite smooth spathes. Sepals and petals hardly 1 line long. Drupes elliptically obovoid, $\frac{2}{3}$ to nearly 1 inch long, dark blue, smooth, 1-seeded, seated on the short, thick, indurated perianth, jointed with the nipple-or disk-shaped, very short peduncle.

HABITAT.—Frequent in the evergreen tropical forests of the eastern and southern slopes of the Pegu Yoma; Chittagong; Upper Tenasserim.

FLOWERS.—In March and April.

* * INTRODUCED SPECIES.

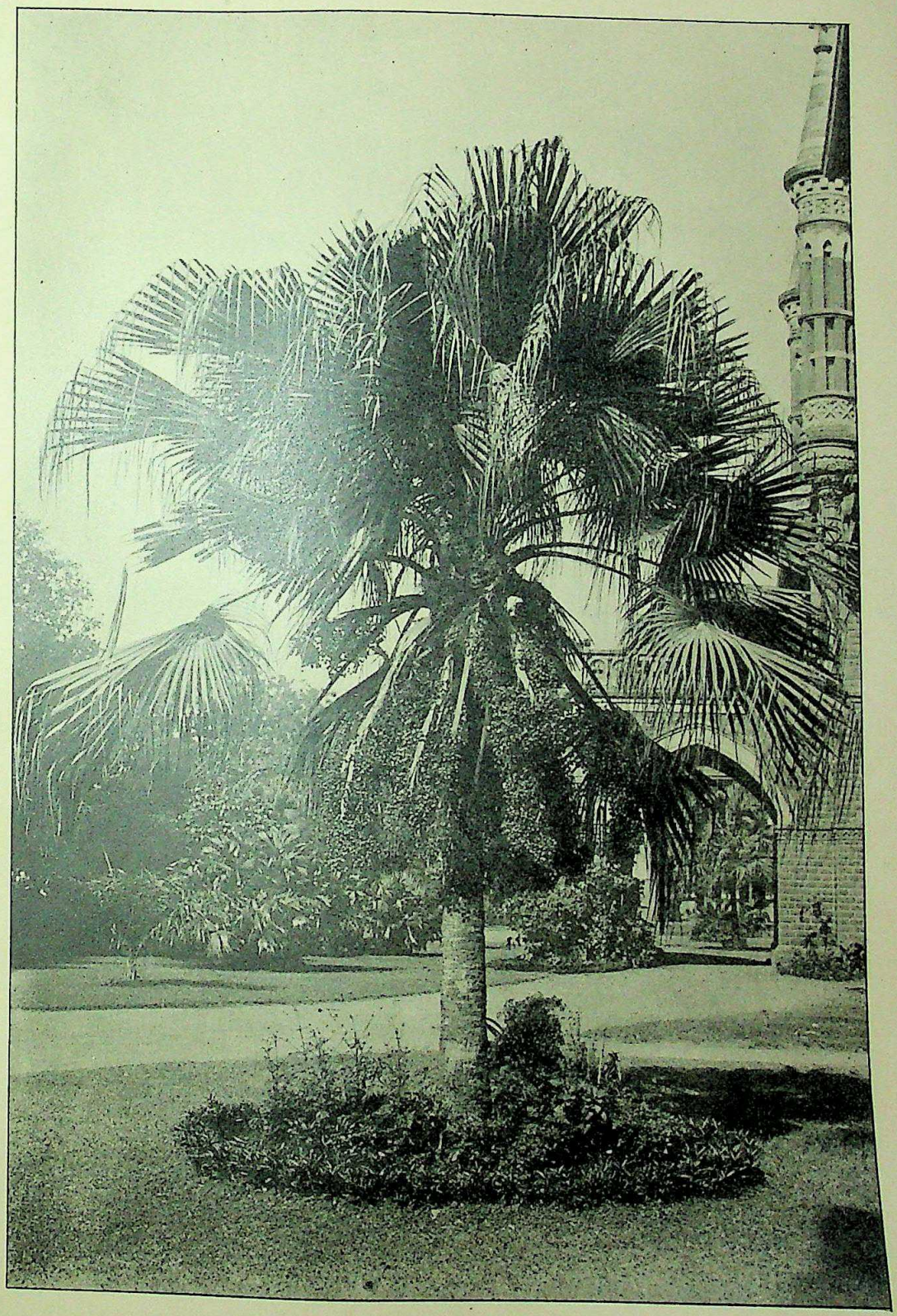
LIVISTONA CHINENSIS, R. Br. Fl. Nov. Holl. 268; Mart. Hist. Nat. Palm. III, 240; Drude Palmae in Nat. Fflanzenf. II, 3·35.—*Latania Chinensis*, Jacq. Frag. Bot. 16, t. ii, fig. 1.—*Latania borbonica*, Lam. Encycl. III, 411; Willd. Spec. Pl. IV, 878; Spreng. Syst. Veg. II, 623.—*Livistona Mauritiana*, Wall. in litt. 1831.—*Saribus*, Bl. Rumphia II, 49.

NAME.—Chinese Livistona.

DESCRIPTION.—Stem 20-30 feet high, stout, obscurely annulate. Crown round, leaves reniformly flabellate, 4-6 feet in diameter, much plicated and also conduplicate along the centre; segments 50-60, and more, linear-lanceolate, acuminate; the lateral ones much the narrowest, 2 feet, or 2 feet 2 inches long, their divisions about 1 foot long. Petiole 6 feet long, 6 inches broad, triangular, plane above or slightly concave towards the margins, armed from the base to about the middle with compressed-subulate, horny, brown spines; at the base a network of brown fibres. Ligule ovate-trigonous, concave, acute, green. Spadix paniculate-ramose,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



SUNDAR TAV. GURUKUL (KANGRI COLLEGE, HARDWAR).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spreading, surrounded at the base and the primary branches by spathes, glabrous or slightly villous. Peduncle less than 1 inch thick; the upper part irregularly divided; the last branches 3-5 inches long. Basilar spathes, compressed, tubular, with the apex bifid; segments triangular, woody-coriaceous, longitudinally grooved. Secondary spathes lanceolate, convex on the ventral side, apex bifid and obliquely open, membranous-coriaceous, villous. Flowers small, white, of an unpleasant smell, usually 4 together. Calix subcampanulate, with 3 rounded teeth having membranous margins. Corolla companulate, larger than the calix, divided below the middle into 3 cordate, erect segments. Stamens 6, included; filaments compressed, united at the base, free in the upper part, those opposite the petals a little larger; anthers small, ovate, dorsifixed below the middle, bifid at the base, apex rounded; pollen elliptic. Ovary small, scarcely half as long as the corolla, 3-carpellary, carpels more or less united; ovules erect, elliptic, one or two usually smaller than the third. Style trigonous. Fruit-bearing spadix nodding, with sub-secund branches. Berry usually one, rarely 2 or 3, olive-shaped, oblong, dull-blue, 7 lines long and 4½ wide. Seed oblong, greyish, on a longitudinal section reniform, intrant process sub-central; embryo opposite to this a little below the centre of the dorsal face, looking downwards.

GERMINATION.—According to Gatin the cotyledonal petiole forms quite in the beginning a swelling just outside the seed. The radicle remains for a long time the principal root, but later on lateral roots are developed which, as to their size, equal or surpass the principal one. The first vegetative leaf is reduced to a sheath.

HABITAT.—China and Japan.—Cultivated in gardens.

FLOWERS in January and February.

CULTIVATION IN INDIA.—"This is perhaps the commonest and finest fan palm in Indian gardens. Its grand fan-shaped leaves gracefully disposed on long petioles, armed with short recurved spines, and rising from a network of brown fibre, render it very attractive. The length of the petiole varies with the position of the plant, being longer in slight shade than in the open. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

palm does well with ordinary border treatment throughout India if watered freely during dry weather." (Woodrow.)

CULTIVATION IN EUROPE.—This palm is quite hardy in Cornwall and nearly so in many less southern districts. In winter the tree is satisfied with a mean temperature of 46½° F.

Goebel's analysis of the ash of the leaves gives an idea of the food required by the palm :

	Young Specimen.	*Adult Specimen.*
Silicia	35,804	36,437
Phosphoric Acid	4,823	5,408
Aluminium and Ferric Oxide ..	6,666	6,605
Lime	6,259	20,931
Magnesia	1,060	5,482
Soda	1,679	traces
Potash	18,434	18,387

DeKerchove had excellent results by adding to the soil 7 parts of assimilable nitrogen, 30 parts of bone phosphate and 50 parts of torrefied animal substances.

Many amateur gardeners in Central and Northern Europe have been sadly disappointed when buying this palm. There are professional gardeners who keep this palm in the hothouse during summer and the plant, though naturally adapted to the temperate house, grows rapidly and acquires great beauty. If, after that, the palm is transferred to the dry drawing room where, besides, the heat of the soil is wanting, the tips of the leaves begin to wither and the stalks of the forming leaves become shorter and shorter, and after a short time no trace of the former beauty is left. If the Chinese Latania is expected to do well in the drawing-room, early and careful adaptation to its future conditions is required.

USES.—Fans are made of the leaves, and rope of the fibrous sheaths of the leaf stalks.

ILLUSTRATION.—The photograph reproduced on Plate XXVI was taken by Mr. Phipson in the garden of the Cama Hospital, Bombay. The overhanging tips of the segments of the leaves give the palm a very graceful appearance. Numerous bunches of fruits, which by their weight bend down the stalks of the spadices, are hiding the upper portion of the straight cylindrical stem.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LIVISTONA ALTISSIMA, Zoll. in Tijdschr. Nederl. Ind. Vol. 14, (1857), 150.—Saribus n. sp.? Zoll. Verz. p. 78.

DESCRIPTION.—Stem 80 and more feet high, slender, about $\frac{2}{3}$ foot in diameter, obsoletely annulate, cinerascent. Habit and conglomeration of leaves similar to that of *L. rotundifolia*, Mart. Leaves palmatifid; lamina cordate-orbicular, a little longer than broad, undivided at the base, plicate; segments about 80, outer ones shorter and narrower, $1\frac{5}{6}$ feet long and $\frac{7}{24}$ inch broad, divided for about $\frac{3}{4}$ of their length, bifid; laciniæ acute with acute sinuses, intra-radial nerves acutely carinate and thickened near the sinus; petiole subrecurved, unarmed, usually about 5 feet long, $\frac{2}{3}$ inch broad at the base. Spadix recurved, sub-nutant, unarmed, decompound, up to 6 feet long, glabrous, fucescent. Spathe scarcely 1 foot long. Fruit globular, about the size of a small cherry.

HABITAT.—Sunda Islands.

USES.—The wood is hard like iron; it is used for rafters.

CULTIVATION IN EUROPE.—*L. altissima* is a very beautiful palm. Its original home being in the Sunda Islands, it is natural that the palm does not grow in Europe except in the hothouse. The stem remains covered for a long time with the bases of the leafstalks.

LIVISTONA SUBGLOBOSA, Mart. Hist. Nat. Palm. III, 319.—Miq. Anal. Ind. II, 7; Flor. Nederl. Ind. III, 59.—*Saribus subglobosus*, Hassk. Tijdschr. Nat. Gesch. IX, 176, 172; Cat. Bogor. 65.—*Saribus rotundifolius* Bl. Rumphia II, 49, tab. 96 (quoad folium tantum).

DESCRIPTION.—Petioles elongate, densely armed with spines, especially in young specimens, leaves suborbiculate, flabelliform-palmatifid; segments usually united beyond the middle, bifid; laciniæ linear elongate, pendulous. Spadix compound paniculate, stout. Drupes subglobose, black-violaceous.

HABITAT.—Java.

LIVISTONA ROTUNDIFOLIA, Mart. Hist. Nat. Palm. III, 241.—*Corypha rotundifolia*, Lam. Encycl. II, 131; Willd. Spec. pl. II, 201;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Spreng. Syst. Veg. II, 138. No. 2; Roem. Schult. Syst. Veg. VII, 2., p. 1309, No. 2; Hayne, Term. Bot. t. 11, f. 1; Houtt. I, t. 2, f. 2.—*Licuala rotundifolia*, Blume in litt. et in Roem. Schult. Syst. Veg. VII. 2, p. 1305, No. 5—*Saribus rotundifolius*, Blume Rumphia II, 49, t. 95, 96 (excl. folio tab. 96).

NAMES.—Wocka (in Termate and Celebes); Saligi, Pohon Sadang (Java); Saribu (Macassar Strait).

DESCRIPTION.—Stem 40-50 feet high, 1-1½ foot and more in diameter, erect or slightly bent, obscurely annulate. Leaves 3-5 feet in diameter, suborbicular; segments between 60 and 90, united in the lower third; each segment bifid to the middle; petiole 6 feet long, lower part armed with strong compressed spines; spines with a conical base, almost ½ inch long. Spadix 3-5 feet long, hanging from between the leaves, porphyry-red. Spathes compressed-cylindric, obliquely truncate. Branches of the spadix decompound, the last branchlets spreading, 3-8 inches long. Flowers 3-4 aggregate, small, globose, yellow. Calyx tripartite, segments broadly ovate, obtuse, concave, keeled on the back. Corolla tripartite, segments triangular, a little larger than the calyx. Filaments broadened at the base; anthers subrotund. Ovary turbinate, trisulcate, 2 carpels abortive; styles connate; stigma simple. Berry depressed-globose. Endocarp thin, brown. Seed globose, ferruginous.

HABITAT.—Malay Archipelago.

USES.—The cellular tissue of the central part of the stem furnishes sago (In the Malayan language 'sago' means bread or flour).

CULTIVATION IN EUROPE.—This palm is pretty for stove decoration, when young.

LIVISTONA AUSTRALIS, Mart. Hist. Nat. Palm. III. 241; Wendl. and Drude in Linnæa XXXIX. 232; Bot. Magaz. t. 6274.—*L. inermis*, Wendl. and Drude, l. c. 229.—*Corypha australis*, R. Br. Fl. Nov. Holl. 26 f; Spreng. Syst. Veg. II, 138, No. 2; Roem. Schult. Syst. Veg. VII, 2, p. 1313, No. 11.

NAMES.—Australian Cabbage Palm. 'Kondo' of the aboriginals in Australia.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DESCRIPTION.—Stem 40-80 feet high, cylindrical, slender, red-brown, annulate. Leaves in a dense oblong crown; petiole spreading and decurved, spinous on the margins; blade 3-4 feet in diameter, orbicular, cut to about the middle into 30-50 radiating slender bifid lobes, the acuminate points of which do not droop. Spathes 6-10 inches long, lanceolate, compressed, acuminate, rigidly leathery, tomentose. Spadix 3-4 feet long, decurved, much paniculately branched, the branches and branchlets curved and slender, quite glabrous, rachis compressed. Flowers minute, $\frac{1}{8}$ inch in diameter, spiked upon the very slender, terminal branchlets, green. Calyx of 3 short very broad, obtuse segments. Corolla of 3 triangular-ovate, fleshy, coriaceous, valvate, subacute petals. Stamens 6; filaments very broad and short; anthers subglobose. Pistillode 3 cleft. Fruit globose, $\frac{3}{4}$ inch in diameter; pericarp thick, crustaceous, granular outside with a smooth buff, obscurely veined inner surface; remains of stigma evanescent. Seed globose, testa pale brown, smooth; chalaza a brown, subterminal, large, polished areole; albumen very hard, white, not ruminate, with a broad, sack-like canal passing from the chalaza to the centre, and full of corky brown tissue; embryo dorsal above the base.

GERMINATION.—In the beginning the embryo becomes longer and grows thicker at the base in consequence of the plumule developing in the interior of the cotyledonal sheath. The axis of the plumule does not coincide with that of the embryo, as it passes laterally through the cotyledonal slit. The embryo has the shape of a cupule.

The first leaf is reduced to a sheath, the second shows the limb spread out.

At the base of the first root some lateral roots are developed which are thin and caducous. Gatin observed in a fourteen months' old plant the formation of a new lateral root, which was stronger than the first and destined, in the course of time, to exercise the function of the principal root.

HABITAT.—The most southern palm of the Australian continent, reaching the snowy range in lat. 37° 30′ S, when its stem attains 80 feet in height, and extending thence along the west coast to the Illawarra River, in lat. 34° 45′ S.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ECONOMIC USES.—The aboriginals of Australia are very fond of the growing centre or heart of this tree, which they eat in a raw or cooked state. But Mueller says that the value of this esculent was not known to them in their uncivilized state.

Leichhardt mentions in his 'Overland Expedition to Port Essington' that the tops of the palm eat well, either baked in hot ashes or raw. Though very indigestible they do not prove injurious to health when eaten in small quantities, but 'several of my companions,' continues the same author, 'suffered by eating too much of the Cabbage-palm.'

The wood, or outer part of the stem is moderately hard and of a light colour. It is occasionally used for walking sticks, slabs for buildings, or the trunks are hollowed out for pig troughs. The central portion of the stem, when young and fresh, is said to be eaten by pigs.

The leaves are used for baskets. The unexpanded fronds prepared by being immersed in boiling water, are dried, and the fibre thus obtained is much valued for the manufacture of hats, which much resemble the celebrated Panama hats.[1]

CULTIVATION IN EUROPE.—On the islands of Hyères in the Mediterranean Sea (not far from Toulon) this palm may be seen growing in the open, but suffers a good deal from the strong wind.

It is one of the best known palms for room cultivation and for the temperate house. It does not suffer from the dry air of the room and is very little subject to the change of temperature. In summer it may be kept in the open. In the hot house it attains a considerable size within short time.

The large rounded leaves are of a beautiful dark green with a metallic lustre. The leaf stalks, when getting old, assume a magnificent brownish red colour. The strong lateral spines of the petiole are almost black and as hard as iron.

Up to 1845 the only way of introducing palms from tropical countries into the hot houses of Europe was by means of young plants. This was not only troublesome and expensive but very

[1] Maiden, J. H. The useful Native Plants of Australia, London, 1889, p. 40, 563, 626.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

often unsuccessful. A lucky chance lead to the discovery that the seeds of palms retain their power of germination for a long time.

Allan Cunningham, the famous botanical explorer, wanted to send some cases of plants from Port Jackson to Kew. When packing the specimens he told the servants to be careful as to the drainage of the lower part of the cases. The men, not having at hand for this purpose either potsherds or pebbles, made use of the round hard fruits of *Livistona australis*, covering with them the floor of the cases. In due time the cases were delivered at Kew, and Mr. Smith, the Curator of the Gardens, was so anxious to see the specimens sent by Cunningham that he personally supervised the unpacking of the cases. He saw the black seeds and noticed at the same time that the white delicate tip of the embryo had already broken through the hard shell. The seeds were at once confided to suitable ground and all the young palms developed rapidly.

From that time Mr. Smith instructed all the collectors in his employment to follow the simpler and safer way of enriching the palmhouses at Kew, *viz.*, by collecting and sending the seeds of the palms instead of young specimens.

How to send seeds to Europe.—The method first adopted by Smith and imitated very soon by all the travellers has long since become the general practice amongst gardeners and botanists.

In order to secure good results, it is first of all necessary to dry the seeds well. They are then put into a case filled with bran, soil, and sawdust in order to prevent them from becoming dried up, because dryness is as harmful to them as moisture. If packed in this way, they germinate on the way and usually arrive in good condition. If they do not germinate, they begin to rot as is mostly the case with seeds that contain oil. The latter begins to become rancid and the seed loses its power of germination.

LIVISTONA HUMILIS, R. Br. Fl., Nov. Holl. 268, No. 2; Spreng.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Syst. Veg. II, 137 ; Roem. Schult. Syst. Veg. VII, 2, p. 1306, No. 2 ; Poir. Encycl. Suppl. III, 482, No. 2 ; Mart. Hist. Nat. Palm. III. 239, t. 109, 110, 111; Wendl. & Drude in Linnæa XXXIX, 231. Benth. Fl. Austr. VII. 146.—L. leichhardtii, F. Muell. Fragm. VIII. 221.

DESCRIPTION.—Stems 4-15 feet high. Leaves orbicular-cordate in circumference when fully out, with a radius of about 1½ foot, deeply divided into narrow plicate segments tapering to a fine point, the thread-like bristles between the lobes varying from nearly 1 inch to very minute, or altogether wanting ; petiole much flattened, the acute edges more or less bordered by small prickles, said to be often intermixed with larger ones even as much as ½ inch long. General panicle very large and loose, the partial ones between the sheathing bracts pyramidal and 8 inches to 1 foot long, twice or three times branched, the ultimate branches or slender spikes ½-1 inch long in flower, often twice that in fruit. Flowers numerous, in little sessile clusters along the spikes. Inner perianth-segments scarcely 1 line long, the outer perianth about ½ as long with short, broad, rather obtuse lobes. Berry ovoid-oblong, obtuse, 7-8 lines long, more or less contracted at the base. Seed oblong, somewhat flattened.

HABITAT.—Australia : Arnhem's Land, Albert River, M'Adam Range, Port Darwin, Port Essington, Liverpool River, Wood Island.

USES.—The wood, or the outer portion of the stem, is hard, and of a light colour. The inner portion is soft and useless.

CULTIVATION IN EUROPE.—This palm is a handsome species for decorative purposes, when young.

LIVISTONA INERMIS, R. Br. Prodr. 268.—Mart. Hist. Nat. Palm. III, 329, t. 145, 146.—Benth. Flora Austral. vol. 7, 146.

NAMES.—'Cabbage Palm' ; 'Partridge-wood.'

DESCRIPTION.—A moderate sized or tall palm, 14-40 feet high and 12-15 inches in diameter, with the ovoid-oblong fruits of *L. humilis*, but said to differ in the petioles entirely without prickles and the lobes of the outer perianth more acute.

Bentham has the following note on this species : " I have seen no specimen of this palm and Martius appears only to have known

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

it from Bauer's drawings which he copied, the general habit being also represented in Flinder's Voyage in the view of Sir E. Bellew's Island, Vol. II, p. 172. It may prove to be a variety only of *L. humilis*."

HABITAT. Northern Australia.

USES.—The outer portion of the trunk of this tree is very hard, beautifully marked and takes a good polish. In colour, it is light-grey, streaked with a darker colour.

ILLUSTRATION.—Mr. Macmillan's photograph, reproduced on Plate XXVII shows a group of palms growing in the Royal Botanic Gardens of Peradeniya. Beginning from the left the picture contains the following trees:

1. *Livistona chinensis*, R. Br., of which only the crown and the upper part of the stem are visible.
2. *Livistona inermis*, R. Br., at the foot of which is standing a Singhalese coolie.
3. *Livistona sp.*, the highest palm with torn leaves.
4. *Howea Forsteriana*, Becc., the slender but low palm quite in front with elegant pinnate leaves.
5. *Livistona olivaeformis*, Mart., just behind Howea; the crown alone is visible.
6. *Oreodoxa regia*, Mart., to the right of Howea; the lichen-covered stem and the crown are visible.
7. *Arenga Wightii*, Griff., quite to the right; only the upper large leaves can be seen, which rise above Oreodoxa.

LIVISTONA OLIVÆFORMIS, Mart. Hist. Nat. Palm. III, 319.—Miq. Anal. Ind. II, 5; Flora Nederl. Ind. III, 59.—*Saribus olivæformis*, Hassk. Tijdschr. Nat. Gesch. IX, 176.

NAME.—Sadang Palm.

DESCRIPTION.—A tree, 15-20 feet high. Leaves palmate-flabelliform; petiole 5-6 feet long, semiterete, glabrous, with recurved spines at the base, for the rest unarmed, with a whitish tomentum on the underside when young; lamina usually 4½-5 feet long, consisting of about 90 segments; segments deeply bifid; laciniæ linear, long-acuminate, pendulous, glabrous on both sides. Spadix

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1-3 feet long, paniculate ; primary branches alternate, 5-6, $1\frac{1}{2}$ feet long ; branches and branchlets terete, glabrous. Flowers fasciculate, ternate or quaternate. Calyx trifid, corolla tripartite, both persistent. Drupe sessile, oblong-ellipsoidal (olive-shaped), slightly constricted at the base, scar of style sub-depressed, 6-$7\frac{1}{2}$ lines long, $3\frac{1}{2}$ lines broad, violaceous-green ; putamen thin, fragile ; albumen white.

HABITAT.—Java.

LIVISTONA HOOGENDORPII, Teijsm. ex Teijsm. & Binn. Cat. Hort. Bog. 71.—André, Illustr. Hortic. vol. 21 (1874), p. 108, 121, t. 174.—*Saribus Hoogendorpii*, Zoll.

NAME.—Hoogendorp's Livistona.

DESCRIPTION.—Stem high, erect, showing triangular scars after the fall of the petioles. Leaves rich dark green, fan-shaped, suborbicular, 5-$6\frac{2}{3}$ feet in diameter, divided into 10-12 lobes of which each has 5-7 sub-divisions, plicate at the base, linear acute at the apex, slightly furfuraceous like the uppermost part of the petiole. Petioles stout, triangular at the base, enclosed in a network of reddish brown fibres, and trigonous, rounded on the dorsal side, furrowed on the sides, $3\frac{1}{2}$-$5\frac{1}{2}$ feet long, reddish brown at the base, passing into olive green ; lateral spines in two rows, very stout, reflexed, $1\frac{1}{2}$-$2\frac{1}{2}$ inches distant from each other, towards the upper part of the petiole smaller and closer together, tubercled at the base, sharp pointed, $\frac{4}{5}$-$1\frac{1}{5}$ inch long.

HABITAT.—Indian Archipelago.

CULTIVATION IN EUROPE.—Hoogendorp's Livistona was introduced in Europe in 1846. It is a very ornamental plant for the hothouse.

ILLUSTRATION.—Plate XXVIII, reproduced after a photograph of Mr. Macmillan, shows a young specimen of *Livistona Hoogendorpii* growing in the Royal Botanic Gardens of Peradeniya.

The stem proper is not visible, being covered by the stout bases of the leaf-stalks. The latter are distinctly armed with strong slightly reflexed spines.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PRITCHARDIA, Seem. et H. Wendl. in Bonpland, IX, 260; X, 197, 310, t. 15.

(After George Pritchard who explored the islands of the Pacific Ocean.)

Benth. et Hook. f. Gen. Pl. III, 928.—Becc. Malesia III, 286; Webbia, II (1907), 200—Calpothrinax, Grisseb. et Wendl. in Bot. Zeitg., 1879, 147.—Benth. et Hook. f. Gen. Pl. III, 927.—Drude in Engl. et Pr. Pflanzenf. II, 3 (1889), 33.

Stem erect, columnar, solitary, unarmed, with annular scars. Leaves terminal, large, flabellate, orbicular or more or less cuneate at the base, undivided in the central part, more or less deeply multifid on the periphery; the segments more or less deeply bifid, with or without filaments between the divisions; ligule short; rachis more or less elongate. Spadix a doubly branched panicle; spathes two or more, complete, imbricate, very large, coriaceous, tubular in the lower part, open on one side of the upper part. Flowers hermaphrodite, scattered or spirally arranged on the branchlets, solitary, sessile on a bracteate pulvinus; bracteoles O. Calyx tubular-campanulate, 3-denticulate. Corolla very much longer than the calyx with a short permanent tube and 3 valvate divisions. Stamens 6; filaments subulate, united at the base, dilatate and forming an erect corona; anthers linear, oblong, versatile. Ovary obovate or turbinate; carpels 3, half-free, united into an elongate style with common punctiform stigma, with one basilar erect ovule. Fruit globular or ovoid, with the remnants of the styles and sterile carpels more or less apical; pericarp thin, grumous or fibrous; endocarp more or less woody, often easily separating from the pericarp. Seed globular, free and erect in the endocarp; hilum small, basilar; raphe lightly impressed, occupying a whole side of the seed; albumen uniform, solid; embryo opposite to the raphe above the base or towards the middle.

Species about 10.—Fiji and Sandwich Islands.—The species described below has been introduced in Indian Gardens.

CULTIVATION IN EUROPE.—Very ornamental stove palms. They grow best in a compost of two parts of peat and one of loam and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

sand. A liberal supply of water is essential. Propagation is effected by seeds only.

PRITCHARDIA PACIFICA, Seem. and H. Wendl. in Bonpl. IX (1861) 260; X, 153, 310, t. 15.—Seem. Flora Vitiensis, 274, t. 79; in 'Correspond. relat. the Fiji Isl., p. 70.—*Corypha umbraculifera*, Forst. Pl. Escul. 49 et Prodr., p. 88 (*ex parte*) (non Linn.)

NAMES.—Viu, Sakiki, Niu Masei (in Viti); Biu (by the Ton guese).

DESCRIPTION.—The palm seldom obtains more than 30 feet in height. Stem smooth, straight and unarmed, at the base from 10-12 inches in diameter. The crown has a globular shape, and is composed of about 20 leaves. Petioles unarmed, 3 feet and more long and densely covered at the base with a mass of brown fibres. Blade of the leaf rounded at the base, fan-shaped, very large, and when young, as is the petiole, densely covered with whitish-brown down, which, however, as the leaf advances in age, gradually disappears. From the axils of the leaves arise flowers, enveloped in several very fibrous flaccid spathes, which rapidly decay and have quite a ragged appearance even before the flowers open. Spadix 3 feet long, stiff and very straight, flowers numerous, minute, hermaphrodite, of a brownish-yellow colour. Fruit perfectly round, about ½ inch in diameter; when quite matured, it has exactly the colour of a black-heart cherry; the mesocarp has a slight astringent taste.

HABITAT.—Islands of the Pacific: Vanua Levu, Viti Levu, Tongan and Samoan Islands.

USES.—The leaves are made into fans, 'Iri masei' or 'Ai Viu,' which (at Seemann's time) were only allowed to be used by the chiefs, as those of the Talipot formerly were in Ceylon. The common people had to content themselves with fans made of Pandanus caricosus. "Hence, though there is not a village of importance without the Sakiki, or, as it is termed in the Samosomo dialect, which suppresses the letter k, Saii, there are never more than one or two solitary specimens to be met with in any place, the demand for the leaves being so limited, that they prove

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

sufficient for the supply. The fans are from two to three feet across and have a border made of a flexible wood. They serve as a protection both from the sun and rain; during a shower of rain the fan is laid almost horizontally on the head, the water being allowed to run down behind the back of the bearer. The leaves are never employed as thatch, though their texture would seem to recommend them for that purpose; the trunk, however, is occasionally used for ridge-beams." (Seemann.)

CULTIVATION IN EUROPE.—Of all the palms introduced in Europe there is none that could rival as regards ornamental effect with this magnificent palm. It was discovered by Seemann on the Fiji Island and some other isles of the Pacific Ocean.

The regular globular silhouette of the crown of leaves borne on a straight erect stem gives the tree a very fine appearance. In the European hothouses the large leaves with long unarmed stalks are at once distinguished amongst the leaves of other palms. The gigantic fans are sometimes 5 feet broad and 4 feet long. Whilst young the leaves are covered with a tawny down which disappears very soon. The imported seeds germinate rapidly.

ILLUSTRATION.—We reproduce on Plate XXIX the photograph of *Pritchardia pacifica*, kindly supplied by Major Gage. The specimen represented is growing in the Royal Botanic Gardens of Sibpur, Calcutta.

WASHINGTONIA, H. Wendl. Bot. Zeit. XXXVII, 68 (1879).

The genus is dedicated to George Washington.

Benth. & Hook. Gen. Pl. III, 923; *Pritchardia* subg. *Washingtonia*, Drude, Engl. und Prantl. Pflanzenf. II, pt. III, 35 (in part) (1889); Baillon, Hist. Pl. XIII, 319 (in part).

Trees, with stout columnar endogenous trunks covered below with thick pale rind and above with the persistent sheaths of many dead leaves, long tough roots and a broad terminal crown of erect, then spreading, and ultimately pendulous leaves. Leaves induplicate in vernation, alternate, flabellate, orbicular, divided

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nearly to the middle into many narrow deeply two-cleft recurved segments, separating on the margins into numerous slender pale fibres, long-petiolate; those of the first year linear-lanceolate; rhachises short, slightly rounded on the back, gradually contracted from a broad base, their margins concave, and furnished below with narrow erect wings, slender and acute above. Ligules oblong, elongated, thin, broad and conspicuously laciniate at the apex. Petioles broad and thin, plano-convex or slightly concave on the upper side, rounded on the lower, armed irregularly with broad thin large and small, straight and hooked spines confluent into a thin bright orange-coloured cartilaginous margin, gradually enlarged at the base into the thick elongated broad concave light bright chestnut-brown vaginas composed of a network of thin strong fibres. Spadix interfoliar, paniculate, elongated, pedunculate, glabrous, its numerous branches flexuose and pendulous; spathes numerous, narrow, elongated, glabrous. Flowers minute, white, articulate on thickened disk-like pedicels in the axils of ovate acute scarious bracts, slender and acuminate before anthesis. Calyx tubular, indurate at the base, gradually enlarged and slightly 3-lobed at the apex, scarious, persistent under the fruit, the lobes retuse, scarious, erose, imbricated in æstivation. Corolla funnel-shaped, the fleshy tube included in the calyx, half as long as the lanceolate acute striate lobes, thickened and glandular on the inner surface at the base, reflexed, imbricated in æstivation, deciduous. Stamens 6, inserted on the throat of the corolla; filaments of the stamens opposite the lobes of the petals consolidated with them for nearly $\frac{1}{3}$ their length and much thicker than the free filaments opposite the sinuses; anthers linear-oblong, attached on the back, versatile, pale yellow, 2-celled, the cells spreading below, opening longitudinally. Ovary superior sessile on a thick disc, depressed—obovoid, 3-lobed, 3-celled, crowned by an elongated flexuose exserted white horny style stigmatic at the apex; ovule solitary in each cell, lateral, erect, anatropous. Fruit baccate, small, ellipsoidal, 1-celled, 1-seeded, short-stalked, crowned with the remnants of the abortive carpels and of the style; pericarp of 2 coats, the outer thin, dry, black, and fleshy, the inner membranaceous, dark orange-coloured, lustrous on the inner surface. Seed free, erect,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

oblong-ovate, convex above the base flat, depressed in the centre, marked by the minute sublateral hilum and the broad conspicuous raphe; micropyle lateral, minute; testa thin, light chestnut-brown, closely investing the uniform horny albumen; embryo minute, lateral, the radicle turned towards the base of the fruit.

SPECIES.—3 or 4.

DISTRIBUTION.—California; ? Arizona.

Botanists have been at variance for a long time as to the number of species belonging to this genus. Some admitted 3, others 2 and many considered it necessary to reduce all of them to one species. Beccari is of opinion that two species, well characterized, but both very variable, can be distinguished. In order to facilitate the correct identification of the specimens grown in Indian gardens we shall give a complete description of the species and varieties as published by Beccari (in Vol. II of the 'Webbia,' p. 187-200), adding *W. gracilis*, Parish, as a distinct species.

CULTIVATION IN EUROPE.—The species of Washingtonia are ornamental greenhouse plants. They are easily cultivated in a compost of rich strong loam to which is added a small portion of vegetable mould and sand. Good drainage and ample supply of water throughout the summer are necessary.

WASHINGTONIA FILIFERA, H. Wendl. in Bot. Zeitg. vol. 37, (1879), p. 68[1].—Sargent, Forest Trees N. Am. 10th Census U. S. IX, 217

(1) It might not be out of place to consider the question why we adopt the specific name "filifera" of H. Wendl. instead of "filamentosa" of O. Kuntze. "Wendland's original species was published as *W. filifera*; but in his Revisio, Kuntze (1891) proposed to change it to *W. filamentosa* on the ground of priority, citing in support *Brahea filamentosa* Wendl. in Cat. Haage & Schmidt (1875), *Pritchardia filamentosa* Wendl. ex Fenzi in Bull. Soc. Tosc. (April 1876). To seek in a tradesmen's catalogue for a pretext for displacing an established name, requires a lust for change almost amounting to a mania. But if an appeal to trade-lists is to be made, priority is against the change, for Haage and Schmidt offered *Brahea filamentosa* in their autumn catalogue of 1875, but in the spring of the same year Linden in his list had put the same plant on the market as *Pritchardia filifera* (Fenzi 1876). *Pritchardia filamentosa* of Fenzi's paper is a *nomen nudum*, being without a word of scientific description or any reference to a published species. As the proper specific name, *filamentosa*, has absolutely no standing." Parish.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(pro parte ?).—Sprenger in Bull. Tosc. Ort. XIV, 319, f. 37.—Beccari in Webbia, II, 187.—*W. filamentosa*, O. Kuntze, Rev. Gen. Pl. II, 737 (1891). —Sargent, Silva N. Am. X, 47, t. DIX (pro parte ?)—*Brahea dulcis*, Cooper, Smithon. Rep. 1860, 342 (not Martius).—*Pritchardia filamentosa*, H. Wendl. in Bot. Zeitg. vol. 34, 807 (1876); Fenzi in Bull. Soc. Tosc. Ort. I, (1876) 116, cum icone xyl.—*Pritchardia filifera*, Linden, Ill. Hort. vol. 24, 105 (1877) cumic. xyl.—*Brahea filamentosa*, Hort. ex S. Wats. in Proc. Am. Acad. XI. (1876), 147.—*Brahea filifera*. Hort. ex W. Wats. in Kew Bull. (1889) 296.—*Brahea robusta*, Hort. ex Salomon, Palmen (1887), 151.—*Corypha filifera*, Hort. ex Salomon, l.c. 151.—*Livistona filifera*, Makay and *Livistona ternatensis*, Hort. ex Salomon l.c. 174.

DESCRIPTION.—Stem rising to a height of 60-70 feet, slightly thickened near the base, where it measures $2\frac{1}{2}$-$3\frac{1}{3}$ feet in diameter, then columnar and getting slightly thinner towards the apex, covered with the dead pendent leaves. Leaves large, measuring $5\frac{2}{3}$ feet from the apex of the petiole to the end of the central segments. Petiole about as long as the limb, dilated at the base into a coriaceous sheath which (in the centre of the crown) measures about 3 feet from its point of attachment to the point where the spines begin, more or less $1\frac{3}{5}$ inches broad at the apex and often $\frac{1}{2}$ inch only, much broader towards the base, plain above, convex below, in the leaves of old plants armed on the margins of the lower half with small spines which are deltoid, slightly or not at all uncinate, $\frac{1}{5}$-$\frac{10}{32}$ inch long; for the rest the petiole is free of spines or shows a very small one here and there; ligule triangular, in shape and length like the rachis, with membraneous dry margins; rachis triangular-elongate, twice or twice and a half times as long as broad, not counting the apical prolongation which projects into the limb. Limb divided to about the middle into about 80 segments, with long pale filaments between the segments and on the margins, equally green and glabrous on both surfaces; each segment deeply two-cleft and the two divisions arising thereof very acuminate and lacerate-filamentose at the extreme end; the central segments at the height of the deepest divisions are $1\frac{3}{5}$-$1\frac{4}{5}$ inches broad, the outer segments become gradually narrower and shorter and more deeply divided, the outermost segments are only $\frac{2}{5}$-$\frac{3}{5}$ inch broad and much shorter than the others. Spadices very large, arcuate-nutant, longer than the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

leaves, with several large partial inflorescences rising from within the tubular primary spathes; these secondary inflorescences consist of several superposed branches, each of which forms a cupressiform partial panicle, $1\frac{1}{3}$-$1\frac{2}{3}$ feet long, very dense, rising from the axil of a spathe; this spathe is tubular at first, but later on split lengthwise, laminar, longer than the respective panicle, $\frac{2}{5}$-1 inch or more broad, truncate, shortly bidentate and ciliate-barbate at the apex. The partial panicles are doubly branched and divided into numerous filiform straw-coloured flowering branchlets which are $2\frac{1}{2}$-$3\frac{1}{5}$ inches long. Flowers in bud lanceolate-acuminate, $\frac{1}{3}$ inch long and $\frac{1}{12}$ inch broad, obscurely angular; calyx tubular-campanulate, truncate at the base, lobes 3, divided to about the middle, broadly ovate, denticulate-crenulate, apex slightly furfuraceous-rubiginose; corolla twice as long as the calyx, tubular in the lower fifth, segments lanceolate-acuminate, subaristate, callous-papillose at the point of insertion of the respective stamen, spreading during anthesis in that part which is not surrounded by the calyx. The stamens opposite to the segments thickly fusiform, attached to the corolla with their lower third; the stamens alternating with the segments are terete, subulate, much thinner than the others, free almost to the base of the corolla; anthers lanceolate-sagittate, acute, shortly bifid at the apex. (Fig 20.)

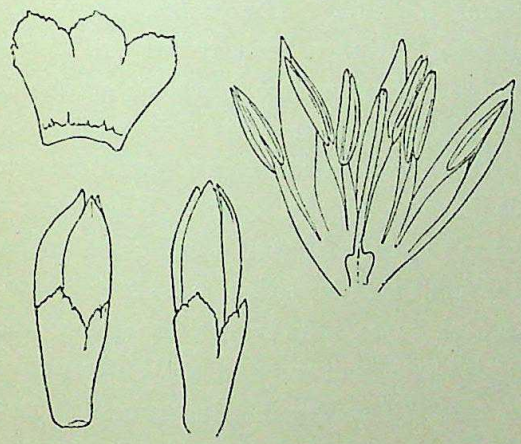


FIG. 20.—Flowers of *Washingtonia filifera*, Wendl. × 3·5. (After Parish.)

Ovary small turbinate, 3-lobed, abruptly contracted into a filiform style. Stigma punctiform, non-lobate. Fruit ovoid, black,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

shining, with fleshy mesocarp, usually $\frac{3}{8}$ inch long and $\frac{2}{8}$ inch broad, surmounted by the permanent, setiform, $\frac{1}{5}$-$\frac{2}{8}$ inch long style. Seed ovate-ellipsoid, equally rounded at the two extremities, no incavation on the side of the raphe.

Sometimes two carpels are developed and in this case the fruits are a little asymmetrical.

HABITAT.—The exact locality of the original home of this species is still doubtful.

Parish, who made a special study of the history of this species, tries to give an answer to the question : " What precisely was the palm variously known to gardeners and seed-dealers as *Brahea filifera* or *Pritchardia filamentosa*, and to which Wendland gave the name *Washingtonia filifera*, and whence came it ? "

" Wendland had before him a few young trees which had been grown in the palm houses of Linden in Ghent. It seems certain that the seeds were brought to Europe by Roezl. They purported to have been collected in Arizona, near the Colorado River, and Fenzi (1876) even gives latitude and longitude, which would locate the parent trees in the neighbourhood of Prescott, Arizona, a region rather of pines than of palms.

" It appears . . . that the only opportunity which Roezl had of procuring seeds of *Washingtonia* was during his visit to San Diego, in December 1869. The notes, however, contain no reference to this palm. But a visit to any of its desert habitats would certainly have been an experience far notable to have failed of record. Nor is it probable that his visit to San Diego, so short and so diligently occupied in collecting, could have afforded time for the difficult journey to the desert. The vague and confused habitat assigned to the palm is itself a sufficient evidence that the collector, from whom the information must have come, could never have visited a native grove. It is safe to conclude that the seeds he sent to Europe came from some of the older cultivated trees at San Diego, and that his pardonable ignorance of local geography prevented him from correctly understanding what was told him of the location of the indigenous groves."[1]

[1] For further information cf. Parish S. B., Roezl and the type of *Washingtonia*, in Bot. Gaz. vol. 48 (1909). 462.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Specimens cultivated in Italy flowered towards the middle of August and fruited in November.

WASHINGTONIA FILIFERA VAR. MICROSPERMA, Becc.—Webbia, vol. II (1907), 191; Parish in Bot. Gaz., vol. 44 (1907), 420.

DESCRIPTION.—Stem as in the typical form. Leaves of adult specimens measuring 5 feet from the apex of the petiole to the extremity of the central segments. Petiole about as long as the limb, armed near the base with small dentiform deltoid, horizontal spines, for the rest unarmed, $1\frac{3}{5}$-2 inches broad at the apex; rachis much more prolonged into the limb than in the typical form, being about 3-4 times longer than broad. Spadix $11\frac{1}{2}$ feet long with partial inflorescences, each about $6\frac{2}{3}$ feet long; the partial inflorescences composed of 6-7 cupressiform panicles, the lowest being the largest, measuring $1\frac{1}{3}$-$1\frac{1}{2}$ feet in length and not differing in any way from those of the typical form; each panicle similarly provided with its spathe, which is broadly linear, $1\frac{3}{5}$-2 inches broad and slightly longer than the respective panicle. Flowers white, with a strong disagreeable odour, in the bud oblanceolate acuminate, very little shorter than in the typical form, slightly attenuate at the base, at the broadest point (towards the upper third) $\frac{1}{12}$-$\frac{1}{5}$ inch broad, not seldom slightly asymmetrical and sometimes more or less obtusely trigonous, calyx tubular-companulate, truncate at the base, divided down to the middle or beyond the upper third into 3 lobes; lobes broadly ovate or suborbicular, with the margins slightly imbricate. Corolla undivided and tubular in the lower fourth; petals lanceolate, acuminate-aristate, slightly concave or almost plain with the margins superposed or imbricate when in bud, delicately striate on the outer side, during anthesis horizontal, very strongly callous-glandular at the base behind the respective stamen. Stamens biseriate, but all of equal length, those opposite to the petals united with these in the lower third, stout, fusiform, subulate at the apex, those alternating with the petals free as far as the corolla is divided, thinner, terete, subulate and not inflexed at the apex, for the rest like the others, anthers about

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

$\frac{1}{8}$ inch long, narrowly lanceolate, acuminate at the apex but often very shortly bifid, and this occurs oftener in the stamens which are opposite to the petals. Carpels 3, very small, free at the base, forming a body slightly longer than $\frac{1}{24}$ inch; ovary turbinate, obtusely trigonous, trilobed and strongly gibbous above; the 3 carpels very abruptly contracted into one filiform trisulcate style with one punctiform undivided and not thickened stigma.

As to the 'undivided style' Beccari does not wish to assert more than what he saw when examining several flowers, and he does not exclude the possibility of the stigma opening into 3 lobes at a certain moment of the development of the flower.

Fruits ovoid, similar in every point to those of the typical form, but long and short diameter by $\frac{1}{24}$ inch smaller; seeds accordingly reduced.

HABITAT.—The original home of this variety is as little known as that of the type.

CULTIVATION IN EUROPE.—In 1874 Linden brought very young specimens to Florence. Since then they have been growing in different gardens in the vicinity of Florence and Viareggio and have produced flowers and fruits.

There is no doubt that the same variety is cultivated in many other establishments in Europe and probably also in India, but they have never been distinguished as such. It is quite possible that a closer examination of all the specimens now known under the specific name of *W. filifera* will disclose many other varieties, and if the number of varieties is increasing, botanists will probably find it convenient one day to reduce all of them to the old well established *W. filifera*, H. Wendl.

WASHINGTONIA ROBUSTA, H. Wendl. in Berl. Garten Zeit. II (1883), 198.—Rev. Hort. 1883, 206 et 1885, 401, f. 73.—Bull. Soc. Tosc. Ort., 1883, 117 et 1886, 301.—Orcutt in Bot. Gazette, IX (1885), 262.—Becc. Webbia, II (1907), 194.—*W. filifera*, (non Wendl.) S. Watson in Bot. Cal. II, 211, 485.—*Washingtonia filifera*, Wendl. var. *robusta*, Parish in Bot. Gaz., vol. 44 (1907), 420.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NAMES.—Desert Palm ; Fan Palm ; Palm Cañon.

The name 'Desert Palm' had been given to the tree actually growing in the Colorado Desert of California, whilst the name of *Washingtonia filifera* was given to specimens growing in European gardens, which were supposed to have been imported from the same locality in California. Though, therefore, the scientific name of the Colorado plant has been changed, the popular name must, nevertheless, be retained.

DESCRIPTION.—Trunk stout, enlarged at the base, 60-90 feet high. Petioles stout and until old erect, $3\frac{1}{3}$-5 feet long, 4-5 inches broad at the dark-brown base, and half as wide at the blade; the upper surface concave, its thin, light-brown margins corneous and armed for their entire length with stout hooked spines, acuminately prolonged into the blade; ligule papyraceous, acuminate, lacerate, $\frac{4}{5}$-2 inches long; blades $3\frac{1}{3}$-5 feet in diameter, the 60-70 folds deciduously tomentulose on the lower edges, cleft two-thirds to the base, the margin of the divisions abundantly filiferous.

Spadices very large, longer than the leaves, nutant with 5-6 large pendent partial inflorescences, each bearing 2-5 separated thyrses, which are exceeded by their ligulate, chartaceus, spathoid bracts; flowering branchlets usually $3\frac{2}{5}$-4 inches long, $\frac{1}{24}$ inch in diameter, sinuose, glabrous, angular with the solitary flowers not very regularly inserted. Flowers, when in bud, $\frac{11}{24}$ inch long, $\frac{1}{10}$ inch broad. Calyx campanulate, truncate at the base, divided halfway down into 3 lobes, lobes more or less ovate, very irregularly ciliate-laciniate on the margin. Corolla much longer than the calyx, divided down to the lower fourth into 3 segments; petals lanceolate, acuminate-subulate, rather strongly calloso-glandular at the base. Stamens biseriate, but of equal length, as long as the petals, the three opposite the petals with the filaments very stout and subulate at the apex, tuberculately enlarged at the coherent base and abruptly subulate above; the other three stamens terete; anthers large, $\frac{1}{5}$ inch long, narrowly linear-sagitlate, apparently acute or apiculate but in reality bifid at the apex for almost $\frac{1}{3}$ of their total length. Ovary turbinate at summit, truncato—rotundate, but neither

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

excavated nor gibbous; stigma bilabiately 3-parted into 3 short lobes. (Fig. 21.)

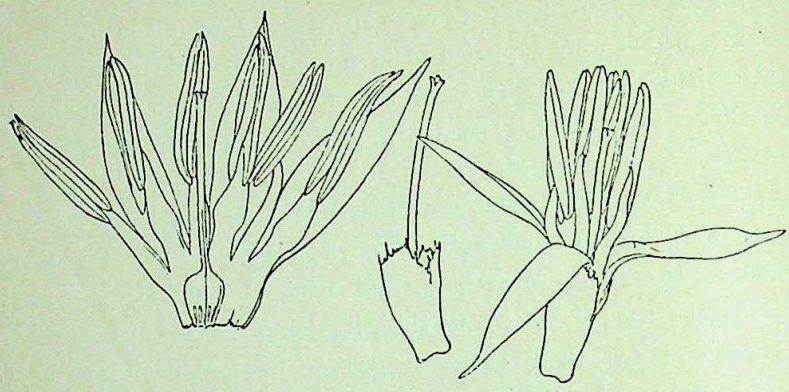


FIG. 21.—Flowers of *Washingtonia robusta*, Wendl. × 3·5 (After Parish).

The fruit ovoid, black, shining, with little fleshy mesocarp, about $\frac{2}{5}$ inch long, and $\frac{1}{3}$ inch broad, terminated by the permanent setiform style. Seed ovate, by $\frac{6}{24}$-$\frac{7}{24}$ inch long and about $\frac{1}{5}$ inch broad, very slightly incavato-umbilicate on the side of the raphe.

The flowers are copiously nectariferous, and exhale a heavy odour, disagreeable when near by, but when diffused somewhat suggestive of the perfume of orange blossoms.

Beccari sustains the specific rank of this palm on the following three characters:—

(*a*) The lobal filaments of the stamens tuberculately enlarged at the coherent base and abruptly subulate above.

(*b*) The stigma bilabiately 3-parted into 3 short lobes.

(*c*) The ovary turbinate at the summit, but not excavated and not gibbous.

"The first two characters," says Parish, "hold in the flowers of Californian trees which have been referred here, so far as concerns the few specimens I have examined. The ovarian character is less satisfactory."

HABITAT.—Borders of the Colorado desert of Southern California, at low altitudes, seldom exceeding 1,100 feet.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"The distribution of the Desert Palm appears to have been determined by the boundaries of the great lake which, in the not very distant part, occupied the central depression of the Colorado Desert. We may reasonably suppose the shores of this ancient lake to have been enlivened, here and there, with groves of stately palms. A few venerable trees still linger near the upper shore line of this vanished sea, gaunt and ready to perish, and without offspring to succeed them; but the most have retired to the cañons of the surrounding mountains. Here they find congenial homes along the few and feeble streams, by some scanty spring, or narrow oasis moistened by alkaline percolations. The necessity of soil moisture is the governing factor in their distribution.

"The most extensive groves occupy a tract of strongly alkaline soil along the foothills some ten miles north of Indio, and extending some of the neighbouring washes. This belt may be considered the centre of distribution. The finest grove occupies, for a mile or more the narrow Palm Cañon, on the opposite side of the desert at the base of San Jacinto Mountain. Here hundreds of fine trees fill the sandy bed of the stream or cling to the rocky bases of its steep sides. The older trees are still vigorous, and there are abundant younger ones of all sizes.

"Most of the cañons at the desert bases of San Jacinto contain palms. A few grow in the cañon of the Whitewater, which is the western limit of the species. Its southern outpost is probably at Carrizo Creek; a few trees at Corn Springs mark its northern limit, and none are known east of Frink's Station." [1]

DURATION OF LEAVES.—The functional life of a leaf is about one year. How long the dead leaves would remain attached to the trunk if undisturbed cannot be stated. Parish mentions a row of trees in San Bernardino over 30 feet high from which the leaves have never been removed, and the lowest are over 25 years old and still firmly attached to the trunk.

The thatch of dead leaves makes an admirable protection to the trunk from the scorching heat and drying winds of the desert. Unfortunately most trees have been deprived of this mantle. Its

[1] Parish S. B. A contribution toward a knowledge of the Genus Washingtonia, in Bot. Gaz., Vol. 44 (1907), 426.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

inflammable material is easily kindled by an accidental fire, and is an almost irresistible temptation to the passing vandal; but the most destruction is attributed to the desert Indians, who are said to burn the dry leaves that they may more easily gather the fruit. To so burn them was the immemorial custom of the desert Indians and it has been erroneously alleged that in this they were influenced by a superstitious motive, *viz.*, the making of an offering by fire to the spirits of the dead. That any plants survive this ordeal of flames is strong evidence of the vitality of the species.

USES.—The wood of the Desert Palm is light and soft, and contains numerous conspicuous dark orange-coloured fibro-vascular bundles. The specific gravity of the absolutely dry wood is 0·5173, a cubic foot weighing 32·24 pounds. Trimble[1], while examining this Palm for tannin, was impressed by the sweet and salt taste of the fresh tissue. Less than one per cent. of tannin was found, but, as the specimen contained 68·97 per cent. of moisture, this raised the amount of tannin to 2·73 per cent. when calculated for absolutely dry substance. The quantity is too small, however, to give the tree any value on account of its astringency. Attention was then directed to the sugar content of the specimen with better results, for the amount found, when calculated for dry substance, was 15·50 per cent. Since this amount was not materially increased by first treating the infusion with acid, it was probably a glucose sugar. The ash in the absolutely dry specimen was found to be 11·86 per cent., over $\frac{1}{4}$ of which was sodium chloride, the actual amount of salt being 3·09 per cent. of the dry substance of the Palm. The specimen analyzed was a cross-section of the trunk at the base of the leaves.

The habitations of the desert Indians were mere shelters, but naturally palm leaves, when easily procured, were utilized in their primitive construction. Strands split from the leaves were convenient for tying, and it is said were sometimes used for the spiral coil with which they built up their baskets. They were also used in building the characteristic granaries used by these Indians for storing the various seeds used by them for food.

---

[1] Garden and Forest, Vol. IX, 133.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Of these food supplies the fruit of the palm was an important part. It was eaten fresh, and also dried for preservation. A favourite method of preparing the dried fruit was by triturating it with water in a stone mortar until a pulpy mass, rich in saccharine properties was produced. The seeds were then separated and the pulp was thickened with meal made from pounded 'chia' (Salvia), or grass seed, or pine nuts. The bony seed itself was pounded into meal which Edward Palmer (1878), who seems to have tried it, pronounces "not inferior to cocoanut," a statement which may be accepted with some reservation. The terminal bud also was baked and eaten. Each grove was the property of a particular clan, to whom alone belonged the right to gather the fruit (Parish).

CULTIVATION.—The Desert Palm was first cultivated by the Jesuits in their mission gardens of southern California long before this region became a part of the United States. It has now become one of the commonest trees in the gardens and streets of the south-western part of California, growing rapidly and vigorously there, as it does in southern Europe, where, in a comparatively short time, it has attained a large size and produced flowers and fruits. Two specimens in San Pedro Street in Los Angeles, believed to have been planted by the Jesuit missionaries, with stems nearly 9 feet through at the ground, are estimated to be 100 feet high. [1]

Wendland founded this species (1883) on young plants grown by Van Houtte at Ghent, and its ascribed indigenous source is evidently wrong, since it was asserted to be "the borders of the Sacramento River." Van Houtte received the seeds under the name of the species already known, and under that name their product was at first sold, until Wendland recognized them as distinct, and published the name *W. robusta.*

About this time collectors began to secure palm seed at Palm Springs, in the Colorado desert. Parish is convinced that this place was the true source of Wendlands second type, and he considers it as certain that most of the trees growing there are

[1] Kinney in Scientif. American, Vol. 60, p. 263.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

identical with those now recognized in Europe as representing that species.

GERMINATION.—At the time of germination the cotyledonal petiole becomes slightly longer and then plumule and radicle develop at the same time. At the base of the primary root there arise some thin lateral roots and after some time it is covered with rootlets. The radicle remains for a long time the principal root, but after the development of several leaves, there arises a new lateral root which is much thicker than the primary root and destined to take its place in the course of time.

The first vegetative leaf is a mere sheath surrounded by the ligule of the catyledonal sheath.

INSECT ENEMY.—According to Parish the Desert Palm is not known to be infested by any parasitic fungus, or to be subject to any bacterial infection. "Its sole enemy", he says, "is the larva of a Bostrychide beetle, Dinapate Wrightii, Horn, the only species of the genus. The female oviposits at the base of the living leaves, whence the larva bores downward through the trunk, its continually enlarging galleries becoming at length 18 mm. in diameter. These are tightly packed, for the most part, with rejected gnawings. The larval life of the insect is three or four years, perhaps even longer. The mature beetle has a length of fully 5 cm. and is the heaviest North American coleopter.

"The number of contemporaneous larvæ that might inhabit a single trunk has been estimated as high as 200 or 300; but Mr. W. G. Wright, who discovered the beetle, and who has assiduously investigated its habits, is of opinion that it would probably not exceed 50. But even such a horde of huge and voraceous grubs, in their comparatively long life, might riddle a whole trunk with their galleries. They seem not to work any great destruction to the groves, however; in fact, the only evidences of their presence to the ordinary observer are the exit holes in dead trunks."

WASHINGTONIA GRACILIS, Parish in Bot. Gaz., vol. 44 (1907), 420
Washingtonia robusta, Hort. (in California, not of Wendland).
Washingtonia robusta var gracilis, Parish ex. Webbia II, 197.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DESCRIPTION.—Trunk slender, at least 65 feet high. Petioles, rather convex on the upper surface, $2\frac{1}{3}$-$3\frac{1}{3}$ feet long, about 4 inches wide at the brown base and $\frac{1}{2}$ as wide at the blade, the corneous margins armed with short hooked yellow spines for the entire length, accuminately prolonged in the blade; ligule papyraceous, narrow, the margin entire; blade $2\frac{2}{3}$-$3\frac{1}{3}$ feet in diameter, the folds 75-80, deciduously tomentose toward the base beneath, cleft little more than $\frac{1}{3}$ toward the base, not filiferous except for an occasional single filament in the sinuses of some of the folds.

Peduncles declined, exceeding the leaves; primary divisions 6-8, each bearing 5-10 separated thyrses, which are mostly exceeded by their narrow, deciduous, chartaceous bracts. Flowers nearly sessile. Calix tubular-campanulate, $\frac{1}{8}$ inch long, the short rounded lobes lacerate. Corolla-tube $\frac{1}{8}$ inch long, its lobes erect, narrowly lanceolate, $\frac{6}{24}$ - $\frac{7}{24}$ inch long. Filaments subulate, $\frac{1}{8}$ inch long; anthers versatile, $\frac{1}{6}$ inch long. (Fig. 22.)

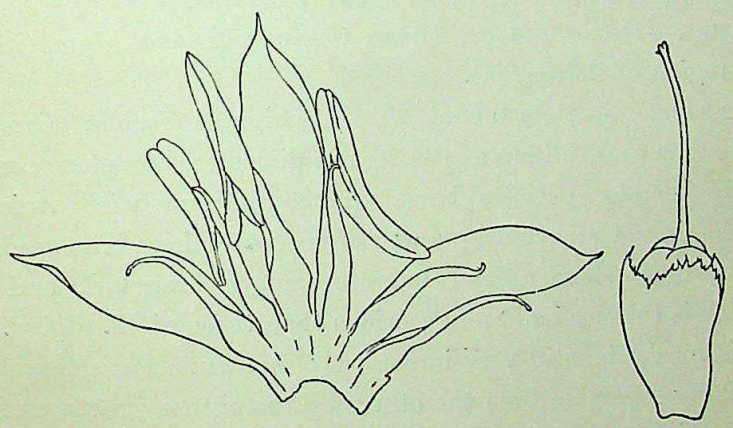


FIG. 22.—Flower of *Washingtonia gracilis* Parish. × 5 (After Parish)

Seeds broadly ovate, $\frac{6}{44}$ - $\frac{7}{44}$ inch long and $\frac{1}{5}$ inch broad, rugose on the side of the raphe.

This palm is readily distinguished from *W. filifera* and its varieties by its slender trunk and smaller and less deeply divided leaves, which are without filaments and on shorter petioles.

Beccari (l. c.) regards this palm as a variety of *W. robusta*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

It seems to me, however, that Parish is right when he says: "It would be possible, although in my opinion undesirable, to regard all the Washingtonias as varieties of a single polymorphous species, but the one now under consideration (*viz.*, *W. gracilis*) would of all be the least capable of such comprehension. Without question floral characters are of greater diagnostic value than those drawn from foliage or habit; but when the latter are of marked distinction, and apparently constant, they cannot be refused great weight." [1]

HABITAT.—Probably indigenous in northern Lower California (Parish).

(Parish's description is taken from cultivated trees growing in San Bernardino and Riverside California.)

WASHINGTONIA SONORÆ, Watson, Proc. Am. Acad. XXIV (1889) 79; XXV (1890), 136; Parish in Bot. Gaz., vol. 44 (1907), 422.

Washingtonia sonora, Hort. in Webbia II (1907), 198.

NAMES.—*Palma Blanca*, *Palma Colorada*, *Palma Nigra* (in the Cape region of California).

DESCRIPTION.—Stem about 25 feet high, 1 foot in diameter. Leaves glaucous, filiferous, 3-4 feet in diameter, borne on comparatively slender petioles beset on the margins with variously curved spines, connected by a web of floccose hairs. The spadix is shorter, more slender, and more sparingly branched, and the perianth is thinner and more scarious than those of *W. filifera*.

This species is still very imperfectly known. Parish says that it is easily separable from the others by the obtuse juncture of the petiole with the blade. The leaves of the young plants he was able to examine were very abundantly filiferous.

Beccari had not had an opportunity of examining flowers of *W. sonoræ*, and he regards it as a doubtful species, which may be a variety of *W. robusta*, suspecting that the obtusely triangular insertion of the petiole in the leaf blade may not prove a constant character.

---

[1] Parish, S. B., The Flowers of Washingtonia, in Bot. Gaz., vol. 46 (1908), 145.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Parish, in the meantime had an opportunity of examining a few flowers taken from the type specimen of this species, collected by W. Palmer at Guyamas, Mexico. The flower has the characters assigned to *W. filifera* so far as the filaments are concerned, the character of *W. robusta* as to the divided tip of the stigma, and the markedly lobate ovary of *W. gracilis*. (Fig. 23).

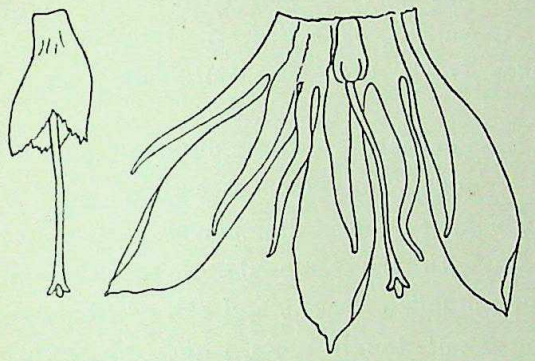


FIG. 23.—Flower of *Washingtonia sonoræ*, S. Watson. × 5 (After Parish.)

It must not be forgotten, however, that these characters are drawn from a study of a few individuals only.

HABITAT.—First collected by Dr. Edward Palmer in 1887 "in secluded cañons in the mountains about Guyamas" (Watson); "in great quantities, and of great size, in the deep cañons running into the Gulf of California, far away from Guyamas" (E. Palmer); La Paz, in Lower California, and on the opposite side of the gulf (collected in these localities by E. Palmer and identified as *W. sonoræ* by Watson).

"The natives of the Cape region," says Parish, "recognize three distinct forms of *W. sonoræ*. Two of these "Palma Blanca" and "Palma Colorada"—are distinguished by the white or red colour of the woody fibre of their trunks. The third—"Palma Nigra"—is said to be the smaller tree, growing at higher altitudes, where winter snows are not infrequent."[1]

[1] For more detailed information on the genus and species of Washingtonia we refer to the extensive 'bibliography' on this subject by S. B. Parish in Bot. Gaz., vol. 44, 1907, p. 431—434.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SABAL, ADANS. FAM. NAT. II, 495.

("Sabal" is said to be a native name in South America; but Adanson who originated the genus, gives no explanation.)

Mart. Hist. Nat. Palm. III, 245 et 319 (excl. *S. serrulata*), t. 103, 130.—Benth. et Hook. Gen. Pl. III, 922.—Drude in Engl. u. Prantl, Pflanzenf. I, 37,—Baill. Hist. des Pl. XIII, 313.—Sargent, Silva N. Am. X, 37.—Beccari, Webbia II (1907), 10.—Sabal et Inodes, O. F. Cook in Bull. Torrey Bot. Club, 1901, 529.

Unarmed trees or shrubs, with columnar and often stout or short annulated endogenous stems ascending while young from a subterranean thickened descending clavate caudex, clothed above for many years with the remnants of the sheathing bases of the petioles of the fallen leaves, and below with light red-brown rind, and long stout tough roots, which ultimately often form a great densely matted ball at the base of a short underground stem. Leaves terminal, induplicate in vernation, alternate, flabellate, orbicular, or cuneate at the base, tough and coriaceous, divided from the apex deeply or slightly into many narrow two-parted long-pointed segments plicately folded at the base, inserted obliquely on the sides of the rhachis, often filamentose on the thickened margins, with narrow midribs prominent below, and numerous slender straight veins; rhachises on the lower surface rounded and broadly winged toward the base, nearly flat and wingless towards the apex, and gradually narrowed to above the middle of the blade of the leaf, thin and acute on the upper surface; ligulas adnate to the rhachises, short or elongated, acute, concave, with thin incurved entire margins; petioles rounded on the back, biconcave with a central ridge on the upper side toward the apex, their margins acute, unarmed, concave and enlarged at the base into elongated chestnut-brown lustrous vaginas of stout tough fibres, young leaves lanceolate to oblong-lanceolate, gradually narrowed into slender petioles, entire. Spadix axillary, pedunculate elongated, decompound, at first erect, its rhachis compressed and flattened horizontally; primary branches short and pendulous or,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

decurved angled or compressed, bearing numerous slender densely flowered secondary branches in the axils of ovate apiculate scarious persistent bracts; spathes numerous, the outer acuminate, enclosing the spadix in the bud, persistent on its peduncle, becoming hard and woody at maturity; the second tubular, conspicuously veined, thick and firm in texture, and scarious oblique at the apex, prolonged on the lower side into a long narrow point, infolding the base of the rhachis, each branch with its short thin spathe and the node of the rhachis below it enclosed in a smaller although otherwise similar spathe. Flowers perfect, minute, glabrous, white or greenish white, solitary on the ultimate branches of the spadix bibracteolate, in the axils of minute ovate acute persistent bracts. Calyx tubular, truncate at the base, unequally three-lobed, the lobes slightly imbricated in æstivation, acute. Corolla deeply 3-lobed, narrowed at the base into a short tube, the lobes ovate-oblong, concave, acute, in the bud slightly imbricated below, valvate at the apex. Stamens 6, those opposite the petals rather longer than the others; filaments white, subulate, dilated at the base, united into a shallow cup adnate to the tube of the corolla; anthers ovate, acute, bright yellow, dorsifixed, introrse, 2-celled, the cells free and spreading at the base, opening longitudinally. Ovary superior, sessile, composed of 3 carpels, 3-celled, gradually narrowed into an elongated 3-lobed columnar style, truncate and stigmatic at the apex, becoming subbasilar on the fruit; ovule solitary in each cell, basilar, erect, semianatropous; micropyle superior, extrorse. Fruit small, baccate, or obovate and gradually narrowed below, black and rather lustrous, 1 or rarely 2-3-lobed, raised on a short stout stem adjacent to the remnants of the style; pericarp separable into 3 coats, the outer thin, sweet and fleshy, mesocarp dry and spongy, closely investing the membranaceous inner coat, lustrous on the inner surface. Seed depressed-globose, free, erect, marked on the side by the prominent micropyle, depressed near the minute basal light-coloured hilum by a shallow pit rugose on the margins; testa thin, light or dark chestnut-brown, and lustrous; raphe basilar, its branches obsolete; albumen uniform, horny, penetrated by a broad shallow basal cavity filled by the thickening of the testa. Embryo minute, lateral or subdorsal.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SPECIES.—About 20.

DISTRIBUTION.—Sabal is confined to the New World, where it is distributed from the Bermuda Islands and the south Atlantic and Gulf coasts of North America through the West Indies to Venezuela. The type has survived from the period when palm-trees abounded in North America and Europe, and traces of its ancestors have been found in the lower eocene of western Europe and in the lignitic formations of Colorado. During the lower miocene period a large Sabal-like tree inhabited Europe as far north as 55 degrees, and existed in Italy until the later miocene.[1]

USES.—The large succulent leaf-buds of the arborescent species are cooked and eaten as a vegetable, although their removal kills the trees.

Coarse hats, mats, and baskets are manufactured from the leaves, which also afford durable thatch for the roofs of buildings.

Pieces of the spongy part of the stem are used as a substitute for scrubbing-brushes, and in the Southern United States brushes are made with the stout strong fibres of the sheaths of the leaf-stalks.

CULTIVATION IN EUROPE.—The species of Sabal are stove and greenhouse plants, or half-hardy. Most of them are highly ornamental and thrive well in a light loamy soil. Propagation is effected by means of seeds, and sometimes by suckers. These should be removed from the parent plant when about 1 foot long and, if they have no roots, must in the beginning be carefully nursed.

SABAL ADANSONI, Guersent in Bull. Soc. philomat. III, (1803) 206, t. 25.—Bot. Mag. t. 1434.—Mart. Hist. Nat. Palm. III, 246, 319, t. 103, f. 2 et tab. morph. S., f. 1, t. Y, f. 4, t. Z II, f. 2, 3, 4.—Pursh, Fl. Amer. Sept. I, 239.—Shecut Fl. Carolinæens. I, 383, No. 1.—Roem. et Schult. Syst. Veg. VII, 2, 1485.—H. B. Croom in Silliman Amer. Journ. XXVI (1834), 313.—Chapman, Flora of the South. Unit. Stat., 2nd ed., 438.—O. F. Cook in Bull Torrey Bot. Club, 1902, 530.—Hasskarl in Retzia, I, 5.—Becc. Webbia II.

---

[1] Lesquereux, Rep. U. S. Geol. Surv. VII., 112. t. 11., f. 3, 3a, t. 12, f. 1 2.
Saporta Origine Paléontologique des Arbres, 118.
Zittel, Handb. Palaecontal. II, 372

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(1907), 20.—*Sabal minor*, Pers. Enchir. I, 399.—Spreng. Syst. Veg. II, 137.—*Sabal pumila*, Ell. Sketch I, 430 (ex Ind. Kew.)—*Sabal minima*, Nott. in Ann. Journ. Sc. Ser. 1, V (1822), 293 (ex Ind. Kew.).—*Sabal caroliniana*, Hort. Paris. fide Schult. fil. ex Kunth En. III, 246.—*(?) Sabal taurina*, Lodd. Cat. 1849 ex Mart. Hist. Nat. Palm. III, 320.—Griseb. Fl. Brit. West Ind. 514.—O. F. Cook in Bull. Torrey Bot. Club, 1901, 530.—*Sabal glabra*, Sargent, Silva North Am. X, 38 in nota.—*Rhapis acaulis*, Willd. Spec. Pl. IV, 1093, No. 2.—Smith in Rees Cyclop. No. 2.—Ait. Hort., Kew. ed. 2, V, 474.—*Corypha minor*, Jacq. Hort. Vindob. III, 8, t. 8.—Murr. Syst. Veg. ed. 14, 984.—Lamark Encycl. II, 131.—*Corypha pumila* Walt. Flor. Carol. 119.—*Chamærops glabra*, Mill. Gard. Dict. ed. 8, No. 2 (ex Ind. Kew.)—*Chamaerops acaulis*, Mich. Flor. Amer. II, 207 (ex Ind. Kew.).

NAMES.—Dwarf Sabal; Swamp Palmetto; Adanson's Sabal.

DESCRIPTION.—A stemless palm with a subterranean rhizome, producing a crown of few leaves. Petioles about as long as the limb and sometime shorter, convex on the underside, broadly channelled above near the base, slightly or not at all concave towards the apex; ligule subtriangular, often inequilateral obtuse or slightly acute; rhachis short, narrowly winged on the margins near the base, straight; limb $\frac{3}{4}$ orbicular or a little more than half-orbicular, divided into 20-30 and sometimes 35 segments; segments acuminate, rigid, entire or very shortly bifid, separated from each other in the central part of the limb for half their length or $\frac{2}{3}$ of the upper part, with a slender and fugaceous filament at the end of the primary sinus; central segments usually $1\frac{1}{2}$-$2\frac{1}{6}$ feet long, sometimes even 3 feet, $\frac{4}{5}$-$1\frac{2}{5}$ inches broad at the height of the sinuses and in well developed leaves even 2 inches. Spadix glabrous, erect, narrow, rigid, 2-5 feet long with 5-6, or also 10-12 branches, each one arising from within a spathe; axis of spadix $\frac{1}{5}$-$\frac{3}{5}$ inch in diameter, subterete in the upper part and more or less compressed in the lower, surrounded by several long tubular spathes without branches; upper spathes tubular in the lower part, acute or acuminate in the upper; branches born on a peduncular part which is surrounded by its respective spathe; the largest partial inflorescences (branches) near the base usually 4-6 inches long; and divided into 8-15 simple branchlets; branchlets more or less angular, filiform $\frac{1}{36}$-$\frac{1}{16}$ inch in diameter and usually 2-$3\frac{1}{5}$ inches long; sometimes the partial inflorescences are 10 inches

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

long bearing 25 and more branchlets of 4 inches in length and subdivided into shorter branchlets; the branchlets of the fruiting spadix are slightly stouter. Flowers inserted spirally and without great regularity on the branchlets, provided with a bract and a bracteole, both exceedingly small and apiculate, in a well developed bud measuring $\frac{1}{8}$ inch, oblong, more or less obtusely apiculate at the apex, when quite open $\frac{7}{48}$-$\frac{1}{6}$ inch long; calyx cyathiform-campanulate, divided down to the middle into 3 broadly triangular or deltoid and slightly acute lobes; petals $1\frac{1}{2}$ times or twice as long as the calyx; petals united at the base into a short tube, ovate-ellipsoid, concave-cymbiform, slightly acute, not denticulate on the margins; stamens all equal, subulate; anthers small, very broadly cordate-sagittate, almost as broad as long. Ovary narrowly trigonous-pyramidal $\frac{1}{10}$-$\frac{1}{9}$ inch long, 3-sulcate; stigma papillose, truncate-capitellate. Fruit supported by the perianth, perfectly spherical, showing the permanent style, when fully ripe $\frac{1}{3}$-$\frac{3}{8}$ inch in diameter, black, shining; pericarp thin, pellicular; mesocarp very slightly fleshy, brown-violescent, slightly bitter. Seed globular, a little depressed, with shining surface, about $\frac{1}{4}$ inch in diameter; hilum eccentric; embryo situated towards the middle of one side or a little below it, penetrating horizontally into the albumen for about $\frac{1}{4}$ of the seed. Sometimes 2 seeds are developed and then the fruit is didymous; sometimes again one ovule is perfect and the other incompletely developed; in this case the fruit is more or less distinctly gibbous at the base.

HABITAT.—In the south-eastern part of the United States: from North Carolina southwards to Florida and westwards to Arkansas, Louisiana and Texas.

Grows in low and humid forests and inundated places, prefers sandy soil; occurs also on the seashore.

NOTE.—*Sabal Adansoni* is a very variable plant showing great adaptability to the various conditions of climate and soil. In this respect it resembles the Indian *Phœnix humilis*.

The polymorphism of the Swamp Palmetto can be observed especially in the vegetative parts and in the greater or smaller number of subdivisions of the partial inflorescences (branches)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Beccari distinguishes 6 different forms; but it must be remembered that it is impossible to define them exactly, as all those forms are united by a great number of transition forms. It is, however, quite probable that a comprehensive study of this palm in its various localities will reveal the existence of well-defined sub-species in equally well-defined areas.

These are the forms mentioned by Beccari[1] :—

(*a*) Leaves large, erect; petioles as long as or longer than the limb. Spadices 3-plicate-ramose; last branchlets very short.

(*b*) Leaves small or of middle size, patent; petioles much shorter than the limb. Spadices duplicate or sub-3-plicate-ramose; last branchlets very short.

(*c*) Leaves large, erect; petioles long; spadices duplicate-ramose or simply branched.

(*d*) Leaves small; spadices simply branched; branchlets rather short and rigid.

(*e*) Leaves small; spadices simply branched; branchlets slender, filiform, elongate, usually not numerous.

(*f*) Spadices simply branched; branchlets with smaller and more numerous flowers than usually.

CULTIVATION IN EUROPE.—The Dwarf Sabal is a greenhouse plant or even half-hardy. In the Mediterranean region it is very often cultivated in the open. Owing to its extraordinary power of adaptation the plant grows equally well in the climate of Calcutta, Peradeniya and Buitenzorg as in that of Florence and Collioure (43° 32′ N. L.).

It is usually not held in very great esteem, because it grows slowly and produces few leaves. In open places which are exposed to strong wind the leaves become torn after a short time. It is, however, not without ornamental effect when grown together with underwood.

ILLUSTRATION.—Plate XXX was reproduced from an excellent photograph taken by Mr. Macmillan.

---

[1] Beccari, O. Le Palme americane della Tribù delle Corypheæ, in Webbia vol. II, 1907), p. 27.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

It represents a characteristic specimen of Sabal Adansoni, Guers.

The petioles channelled towards the base, are about as long as the leaf-blade. The almost triangular ligule is distinctly visible on one of the left-hand leaves. Some of the segments are entire, but most of them are very shortly bifid. From between the leaves there rises a long spadix with about a dozen branches. In the upper part the flowers have just opened. The specimen is growing in the Royal Botanic Gardens of Peradeniya.

SABAL PALMETTO, Lodd. ex Roem. et Schult. Syst. Veg. VII, pt. 2, 1487, No. 5.—Mart. Hist. Nat. III, 247.—Dietrich Syn. II, 1201.—Kunth, Enum. III, 247.—Spach. Hist. Veg. XII, 107.—Chapman, Fl. South Unit. St. ed. 2a, 438.—Curtis, Rep. Geolog. Surv. N. Car. (1860), III, 64.—Sargent, For. Tr. N. Am. 10th Cens. U. S. IX, 217.—Nash in Bull. Torrey Bot. Club, XXIII, 99.—Beccari, Webbia, II, 32.—*Sabal umbraculifera*, Mart. Hist. Nat. Palm. III, 245, t. 130, et tab. morph. T, f. 5 ; t. Y, f. 5, 6, 7 ; t. Z, I (excl. syn. Glazeb. et local[1].).—Griseb. Fl. West. Ind. Isl. 514.—*Inodes palmetto*, O. F. Cook in Bull. Torrey Bot. Club, 1901, 532.—*Corypha umbraculifera*, Jacq. Fragm. Bot. (1809) 7, No. 47.—*Corypha palmetto*, Walter, Fl. Carol. 119 (1788).—*Corypha glabra*, Mill. ex Salomon, Palmen, 150.—

---

[1]. Beccari gives the following reasons for his identifying *Sabal umbraculifera*, Mart, with *Sabal palmetto*, Lodd. :—

"I have referred to *S. palmetto* the species of Martius *S. umbraculifera*, which this author founded on *Corypha umbraculifera*, Jacq. (non Linn.). Martius writes with reference to this palm that it was brought by Jacquin from his journey in America and that it flowered in the Garden of Schœnbrunn. Jacquin, however, affirms that his *C. umbraculifera* came from Holland. Apart from this contradiction it is pretty sure that the description as well as the drawings of *S. umbraculifera* published by Martius were taken from the specimen which flowered at Schœnbrunn. Of this specimen I have seen a part of the spadix in the herbarium of Berlin, corresponding in everything and in the minutest details of the flower with wild specimens of *S. palmetto*. Though Martius wrote that his *S. umbraculifera* grows in Cuba and Haiti, this statement must be considered as erroneous, because it was probably founded on the supposition that the palm described was brought from those regions by Jacquin. The specific name of *Palmetto*, Lodd. as recognized in Roem. et Schult. is certainly older than that of *umbraculifera*. Though we are not sure as to the exact date of the publication of that part of Martius' work in which that name occurs for the first time, Martius himself mentions on p. 247 *S. Palmetto* as one of those species of which he is not able to say exactly in which point they differ from his *S. umbraculifera*."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Chamaerops palmetto, Mich. Fl. Bor. Am. I, 206 (1803).—Willd. Spec. Pl. IV, pt. II, 1158.—Mchx. f. Hist. Arb. Am. II, 186, t. 10.—Pursh, Fl. Am. Sept. I, 240.—Nuttal, Gen. I, 231.—Elliot, Sk. I, 431.—Spreng. Syst. II, 137.—Croom, Am. Journ. Sc. XXVI, 315—London, Arb. Brit. IV 2532.

NAMES.—Cabbage Palmetto, Cabbage Tree, Pond Thatch, Pond Top.

DESCRIPTION.—A tree, with a trunk often 30-60 feet in height and 2 feet in diameter, broken by shallow irregular interrupted fissures into broad ridges, with a short pointed knob-like caudex surrounded by a dense mass of contorted roots, often 4 or 5 feet in diameter, and 5 or 6 feet deep, from which tough light orange-coloured roots, often nearly $\frac{1}{2}$ inch in diameter, covered with thick loose rind easily broken into narrow fibres, and furnished with short slender brittle rootlets, penetrate the soil for a distance of 15 or 20 feet, and crowned with a broad head of leaves which are at first upright, then spread nearly at right angles with the stem, and are finally pendulous. Leaves suborbicular with numerous segments (as many as 80 in cultivated specimens) measuring $4\frac{1}{3}$-$4\frac{2}{3}$ feet from the apex of the petiole to the end of the central segment; petiole apparently a little longer than the limb, robust, at the apex 1-$1\frac{2}{3}$ inches broad and plain or slightly concave above and convex below; ligule lanceolate or lanceolate-acuminate; rhachis stout winged at the base on both sides, curved and prolonged almost to the apex of the leaf. The central apical segments are much smaller than those in the middle of the sides. All the segments, included the outermost ones, are deeply bipartite, finely striated with numerous distinct secondary and tertiary nerves, of the same colour on both sides; primary and secondary sinuses provided with a distinct filament. Spadices forming large compound panicles as long as, or longer than, the leaves, nutant whilst in flower and curved-reflexed when in fruit; partial inflorescences forming secondary panicles of 1-$1\frac{1}{3}$ feet in length, the upper ones even shorter, each one divided into 6-10 alternately distichous branches; spathes of the partial inflorescences narrowly sheathing, tubular-infundibuliform, brown and dry in the terminal part, very finely striate, entire and obliquely truncate where they open,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

prolonged on one side into an acuminate point; branches of the artial inflorescences (inflorescences of the 3rd order) patent and arcuate in the lower part, 5-6 inches long, inserted within the respective spathe and each one having its own small tubular spathe which is dry, bicarinate on the axillary side, shortly bidentate or bicornute at the apex; branches angular and giving off 10-20 flower-bearing branchlets in a spiral arrangement; branchlets patent and slightly arcuate, simple, filiform, more or less angular, thin, $\frac{1}{24}$-$\frac{3}{48}$ inch in diameter at the base, subulate, $2\frac{2}{3}$-4 inches long, arising from the axil of a small broad scarious acute bract. Flowers arranged spirally and not very regularly, about 30-40 on each branchlet; at the base of each flower a large scarious acute and apiculate bract and a similar but smaller bracteole. Flowers in well developed bud about $\frac{1}{6}$ inch long and about $\frac{1}{12}$ inch broad, oblong, obtuse; when open $\frac{1}{5}$ inch long or slightly longer; calyx shortly companulate, divided almost to the middle into 3 large deltoid narrowly scarious and non-ciliate lobes; carrolla more than twice as long as the calyx tubular in the lower $\frac{2}{5}$, concave-navicular; stamens as long as the petals; filaments subulate, anthers versatile, ovate-sagittate. Ovary including the style measuring about $\frac{1}{8}$ inch in length; style elongate, columnar, subtrigonous, slightly thicker at the base than in the upper part; stigma capitellate. Fruit perfectly spherical, $\frac{10}{24}$-$\frac{11}{24}$ inch in diameter, black and lustrous with the remains of the style distinctly visible at the base; epicarp thin, fragile, easily separable from the mesocarp which is slightly fleshy; fruiting perianth shortly pedicelliform. Seed globose-depressed, regularly hemisperical in the upper part, $\frac{7}{24}$ inch broad, light bright chestnut coloured, flattened at the base and corrugate round the hilum, which is not very eccentric; micropyle very small; embryo situated about the middle of one side, deeply and obliquely penetrating into the albumen with the point directed downwards.

GERMINATION.—This process begins with the growth of the cotyledonal petiole, the radicular end of the embryo breaking through the seed coat. The radicle continues growing for some time, but the rate of growth becomes slower at the moment when

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

there appears a lateral emergence which increases rapidly in bulk, and from which, after some time, the plumule emerges. The primary root, producing a few rootlets, remains the only one for a long time. After this the cotyledonal ligule begins to swell and becomes longer towards the base. From this newly formed body (called stolon by Karsten[1]) there arise adventitious roots which are below the primary root.

FLOWERS.—In June (in North America); fruit ripens late in the autumn.

HABITAT.—This palm inhabits sandy soil in the immediate neighbourhood of the coast, and is distributed from Smith's Island at the mouth of the Cape Fear River, North Carolina, to Key Largo, Florida (26° N. L.) and along the Gulf coast of the mouth of the Appalachicola River. Often forming groves of considerable extent on the Atlantic coast, it is most abundant and grows to its largest size on the west coast of the Florida Peninsula South of Cedar Keys.

"The survival of Sabal palmetto, with its tall columnar trunk and broad crown of foliage, the most boreal of existing palm trees in a region where the flora is northern in its predominating types, gives special interest to the coast of the south-eastern United States, where it is the most conspicuous feature of the vegetation." (Sargent).

USES.—The wood of the Cabbage Palmetto is light, soft, and pale brown in colour, and contains numerous hard fibro-vascular bundles which make it difficult to work, the outer rim of the stem, about 2 inches in thickness, being much lighter and softer. The specific gravity of the absolutely dry wood is 0·4404, a cubic foot weighing 27·45 pounds. In the Southern States the trunks are used for wharf-piles; polished cross-sections of the stem sometimes serve for the tops of small tables, and the wood is largely manufactured into cases. From the sheaths of young leaves the bristles of scrubbing-brushes now often used in the United States are made in Florida in considerable quantities. To obtain the fibre used in the manufacture, 3-4 feet of the top of the tree, 'the bud,'

Karsten. Ueber die Bewürzelung der Palmen. Linnæa, p. 601-608. Halle, 1856.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as it is technically called, consisting of the closely imbricating young leaf-stalks, is cut off and trimmed down to a diameter of about 8 inches. In this form the bud is received at the factory, where the soft edible core, consisting of the youngest leaves, is removed, leaving a cylinder with walls about 3 inches in thickness. This is boiled and shredded by machinery specially devised for the purpose, and when the fibre is dried, it is ready for the brush-maker. One factory in Jacksonville, Florida, used (1896) weekly 7,500 buds obtained chiefly from the west coast of the peninsula. As only young and healthy trees are used, and as the removal of the bud kills the tree, the industry is a wasteful and expensive one, destined to exterminate the Palmetto. Its existence is also threatened by the use for culinary purposes of the cabbage, or terminal bud, which is considered a great delicacy by the negroes of the Southern States of N. America.

Sleeping mats are made from the young leaves, and hats from the inner portion of the young leaves. They are said to be very cheap and durable. From the same material fancy baskets are made, also rope of the young leaves split and twisted.

Historical Note.—The Cabbage Palmetto has played an important part in the history of South Carolina. On June 28, 1776, a force of less than one hundred Carolinians, under command of Moultrie, protected by the rude fortification on Sullivan's Island in Charleston Harbour, made of the trunks of the Palmetto, repulsed the attack of a British fleet under command of Sir Peter Parker, and when the State of South Carolina was organized, the State seal, which was first used in May 1777, was made to commemorate this victory. A palm-tree growing erect on the seashore represents the strength of the fort, while at its base an oak-tree torn from the ground and deprived of its branches recalls the British fleet built of oak timber overcome by the Palmetto.[1]

Cultivation.—It is remarkable that *Sabal palmetto*, which might be expected to be the hardiest of all arborescent palms, has remained comparatively rare in gardens. A plant has long been cultivated in the Palm House of the Royal Gardens at Kew and the

[1] John Drayton. Memoirs of the American Revolution, II, 372.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

species is said to be established in Ceylon. In California, where nearly all the palms of temperate regions grow vigorously, it has not proved a success. It is cultivated in the gardens of Southern France and the Riviera where the tree is known under the names of *Sabal umbraculifera* and *Sabal Giesbreghtii.*

Beccari recommends the introduction and acclimatization of this palm in the vast barren marshes of southern Italy and Sicily, not only because the Cabbage Palmetto is propagated very easily, but also on account of its economic uses.

ILLUSTRATION.—The Cabbage Palmetto of Plate XXXI is growing at Peradeniya. We have to thank Mr. Macmillan for taking the photograph.

SABAL MAURITIÆFORMIS, Gr. and Wendl. in Griseb. Fl. Brit. West. Ind. 514; Drude in Engl. und Prantl, Pflanzenf. I, 36, f. 27; Becc. in Webbia II (1907), 61.

Trithrinax mauritiæformis, Karsten in Flora, vol. 28 (1856), 244 and in Fl. Columb. Sp. select. II, 137, t. CLXXII.

Sabal glaucescens, Lodd. ex Mart. Hist. Nat. Palm. III, 247 ? fide Griseb.

NAME.—Savannah Palm.

DESCRIPTION.—Trunk cylindric, columnar, distinctly annular-cicatricose (the rings 6 inches distant), 60-80 feet high, 12 inches in diameter. Leaves very large. Petiole long and comparatively slender, fugaceously furfuraceo-cinerescent on the lower side, about $1\frac{1}{5}$ inches broad, much depressed, flat above in the upper part, slightly convex on the underside with the margins very acute. Ligule well developed, 2 inches long; rhachis considerably elongate and arcuate. Limb quite glabrous, measuring about $6\frac{2}{3}$ feet from the apex of the petiole to the end of the median segments, rigid-papyraceous, but thin, green above, distinctly paler and almost glaucescent below, divided into many broad laciniæ down to almost the lower fifth; laciniæ $2\frac{2}{5}$-$2\frac{4}{5}$ inches broad, with their sides parallel or slightly divergent up to about $1\frac{1}{3}$ feet from the apex; here they are once more divided into two laciniæ which in their turn about 8 inches higher up are divided into 2 very acuminate flaccid points; the limb, therefore, is three times divided and there are 3 sinuses; sometimes 2 primary segments are united with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

each other up to the second sinus; at the lowest sinus there ends a secondary upper rib, at the second sinus the primary upper ribs and at the third sinus the primary lower ribs; the primary segments are consequently 3-costate. Spadices large, longer than the leaves, with various partial inflorescences $1\frac{1}{6}$-$1\frac{1}{3}$ feet long and forming lax panicles. Secondary spathes tubular, striato-nervate, prolonged at the apex into a triangular acuminate point, entire at the mouth or scarcely split on the ventral side even when the fruits are ripe; each partial inflorescence consisting of 7-8 primary branches of which the lower are divided into 6-7 branchlets and the upper ones in 3-4; peduncular part of each branch provided with a special spathe exerted from the larger spathe and deeply divided into 2 points or subulate horns; branchlets very angular, filiform, $\frac{1}{24}$-$\frac{1}{16}$ inch thick $2\frac{2}{5}$-$2\frac{4}{5}$ inches long, with numerous flowers, each arising from the axil of a very small, triangular, accuminate bract.

Flowers in bud $\frac{1}{8}$ inch long, $\frac{1}{18}$ inch broad, oblong, slightly restricted and acutate towards the apex. Calyx cupular-cyathiform, divided beyond the middle into 3 triangular acuminate lobes; carolla thrice as long as the calyx, shortly tubular below. Ovary conico-pyramidal, elongate, marked with the irregular impressions of the stamens; stigma capitellate. Fruiting perianth with the calyx perfectly truncate at the base, petals deflexed, of the stamens the subulate filaments alone remain of which those opposite the petals are deflexed and the others erect.

Fruit globose-obpyriform, subresupinate, $\frac{1}{2}$ inch long, perfectly spherical at the apex where it measures $\frac{9}{24}$-$\frac{10}{24}$ inch, attenuate into a somewhat asymmetrical base or incurved; style persistent, about $\frac{1}{12}$ inch long, curved below. Surface of fruit black, shining, indistinctly and minutely granular under the magnifying glass; pericarp finely crustaceous, fragile, dry; mesocarp almost reduced to nothing. Seed hemispherical, or with the upper part rotundate and the lower flattened-undulate; hilum very eccentric, almost lateral. Surface of seed blackish brown, minutely and not very distinctly granular under the magnifying glass. Embryo situated about the middle on the hilar side, obliquely and rather deeply descending.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

To the left: SPINY LICUALA (*Licuala spinosa*, Wurmb.).
In the centre: SAVANNAH PALM (*Sabal mauritiæformis*, Gr. et Wendl.).
To the right: CHINESE LIVISTONA (*Livistona chinensis*, R. Br.).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HABITAT.—In the moist warm forests of the old Republic Columbia (Karsten); Trinidad (Grisebach); Venezuela (Bot. Gard. of Buitenzorg).

CULTIVATION IN EUROPE.—The Savannah Palm must be treated as a stove plant.

ILLUSTRATION.—Plate XXXII represents a group of palms from the Royal Botanic Gardens, Peradeniya. The photograph is by Mr. Macmillan.

To the left of the picture there is dense tuft of the Spiny Licuala (Licuala spinosa, Wurmb.), which we described in the last number of this Journal on p. 81. The palm in the centre is the Savannah Palm (Sabal mauritiæformis, Gr. et. Wendl.), whilst on the right there is a small specimen of Livistona chinensis R. Br.

This palm may easily be distinguished by the following characters: The chief divisions of the leaves have got 3 ribs; the colour of the undersurface of the leaves is glaucescent; the fruits are very much narrowed at the base; the seed is provided with a central-rotundate tubercle and the hilum is considerably eccentric; three stamens of the fruiting perianth are erect and three reflexed; the corolla-lobes are acuminate and not nervose-costulate.

SABAL BLACKBURNIANA, Glazebrook in London's Gardener's Mag. V (1829), 54, cum ic. xylogr.; Roem. & Schult. Syst. Veg. VII, 1488; Hemsley in Voy. Challenger, Botany I, 70, t. VI—IX (excl. syn. aliquibus) Becc. in Webbia II (1907), 54.—*Sabal palmetto* (non Roem. & Schult.) Rein in Bericht Senckenb. Naturforsch. Gesellsch., Frankfurt a. M. (1873) 150; J. Morris in Bull. Torrey Bot. Club (1885) 72.—*Sabal Adansoni* (non Guers.) A. H. Moore, List of Pl. collect, in Bermuda 1906, et exsiccata no 3142 (ex Becc. l. c.).—*Sabal Mocini* Hort., Riccobono in Boll. Soc. Ort. Palermo (1904) 32.—*Chamærops excelsa* and *Chamærops palmetto* Lefroy's List Bermuda Pl. (ex. Hemsl. l. c.)—*Chamærops glabra* Jones, Naturalist in Bermuda, 136 (ex. Hemsl. l. c.) *Inodes Blackburniana* O. F. Cook in Bull. Torrey Bot. Club (1901) 531.

NAME.—Bermuda Palm.

DESCRIPTION.—Trunk stout, straight, columnar, cylindric, growing more than 40 feet high, $1\frac{1}{3}$ feet in diameter, annulate-cicatricose. Leaves of adult plant very large, suborbicular, with numerous

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

segments; petiole 8 feet long and up to $2\frac{2}{5}$ inches broad in the upper part, convex below, slightly concave above. Ligule up to 6 inches long, lanceolate, acuminate, with the margins involute. Rhachis prolonged to close the apex of the limb and strongly arcuate, with acute sides and winged in the lower part. Limb about as long as the petiole from the ligule to the apex of the central segments. The apical central segments much shorter and narrower than the outermost ones; all are long-ensiform and deeply bipartite; segments of the intermediate part of the sides 4 feet long and $1\frac{3}{5}$ inches broad at the height of the sinuses; the primary sinuses are at about the lower third and the secondary ones towards the middle, with a rather strong filament in each of them.

Spadices shorter than the petioles of the leaves, thrice branched, with rather dense partial inflorescences; secondary spathes tubular, narrowly infundibuliform, papyraceous-membranous, dry, comparatively short, $2\frac{1}{5}$-$3\frac{1}{5}$ inches long, obliquely truncate at the mouth, where they are prolonged into a short, broad, triangular, acute or acuminate point, finely striate. Branches divided into various simple, flower-bearing branchlets; peduncular part short, much longer than the respective spathe, provided with its own tubular acutely bicarinate spathellule; branchlets arising from the axil of a short, broadly triangular, acute bract, flexuose, 4-6 inches long, angular, $\frac{1}{12}$-$\frac{1}{8}$ inch thick at the base, gradually alternate-subulate towards the apex, not thickened when fruiting but with the pulvinuli bearing the fruits slightly tuberculiform. Flowers relatively large, $\frac{1}{5}$ inch long when in bud, oblong, rotundate above. Calyx cupular or shortly tubular, slightly contracted at the throat, with a broad and fleshy base, divided in the upper third into 3 broadly triangular lobes. Corolla a little more than thrice as long as the calyx. Stamens inserted a little below the middle of the corolla, relatively stout, subulate, very acute, acutely carinate along the median line towards the apex; anthers sagittate, ovate, acute. Ovary $\frac{1}{6}$ inch long, slightly attenuate-conical towards the apex; stigma capitellate.

Fruits (comprising the perianth $\frac{4}{5}$-$\frac{11}{12}$ inch long and $\frac{2}{3}$-$\frac{4}{5}$ inch broad, obpyriform, with the apex regularly rotundate, alternate to a rather acute and symmetrical base; fruiting perianth small,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

reduced to the hardened calyx which is not accrescent; remains of style slender and straight; surface black; mesocarp fleshy, brown-violaceous, $\frac{1}{8}$-$\frac{1}{6}$ inch thick; endocarp reduced to a very thin pellicle. Seed of the colour of roasted coffee, globose-depressed, $\frac{11}{24}$-$\frac{1}{2}$ inch long and $\frac{1}{3}$ inch broad, with the base flattened and slightly concave; hilum almost central; embryo subdorsal, descending and penetrating beyond the middle of the albumen. Often 2 ovules are developed and in this case the fruit is perfectly didymous.

HABITAT.—Bermuda Islands.

USES.—Of the leaves of the Bermuda Palm hats, baskets, fans, etc., are made.

CULTIVATION IN EUROPE.—*Sabal Blackburniania* is one of the finest species of the genus and is very ornamental in open places where the tree is allowed to develop freely.

This species is easily distinguished by its large dimensions, by the spadix which is shorter than the petioles of the leaves, and by the large obpyriform fruits.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA.

REPORT BY R. C. WROUGHTON, F.Z.S.

COLLECTION	... No. 1.
LOCALITY	... East Khandesh.
DATE	... March-May 1911.
COLLECTED BY	... Mr. C. A. Crump.

As this is the first report on the results of the Mammal Survey, a few words as to the reasons for, and objects of, the Survey will not be out of place.

In 1758, Linnæus published the tenth Edition of his "Systema Naturæ," which, later, was formally accepted by common consent as the Foundation Stone of Systematic Zoology. A great number, if not the larger proportion, of the animals included in that work had never been seen by its author, who described them from the writings of other naturalists, only accepting however such as had been figured.

The Linnæan "Genera" were almost as wide as what are now called "Families." For instance, *Simia* embraced all the monkeys from the African Chimpanzee to the American Marmoset, while the genus *Mus* included such widely different forms as the Guinea Pig, the Marmot, and the Flying Squirrel, as well as the Rats.

In proportion as communications improved and travelling became easier, more specimens reached European Museums, and zoologists came more and more to see the necessity for multiplying species, yet nevertheless, under the influence of the accepted theory of created species, it was not held to be an improbable thing that a "species" should co-exist in most widely separated parts of the world.

With the publication of Darwin's Theory of Evolution it was brought home to systematists, that further multiplication of genera and species was necessary.

Turning now specially to Indian Systemic Mammalogy, we find that during the middle third of the nineteenth century, quite a number of men were working at the subject on the spot. Horsfield

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and Cantor in Malaya, Hodgson in Nepal, Hardwicke in what is now the United Provinces, Sykes in the Dekhan, Elliot in the Southern Mahratha Country, and Jerdon in Southern Madras were all collecting and, to a greater or less extent, working out their collections. Many others again, such as Hutton, Boys and Tytler were also collecting, while Blyth in India, Gray at the British Museum, and others were dealing with the material so collected. An immense advance was made in the classification of the Oriental Mammals and indeed all the obvious species were recognised, named and recorded. The work was all however on pre-Darwinian lines, *i.e.*, the written descriptions dealt, for the most part, only with salient characters and marked differences, very many of which are now known to be almost generic. Moreover, distances in those days were enormous and the distribution of literature slow, and each man worked separately, so that over and over again, in some cases the same animal, and commonly the same species of animal from different localities, was described and named by two or more workers.

In recent years it has been fully recognised that not only is it necessary to classify the "species," but that it is equally or even more important to systematically record geographical variations, which when sufficiently multiplied may, in the future, furnish data for the investigation of the problems of variation and distribution. To this end it is necessary to examine, compare and record not only well marked and striking differences, but even the most trivial, *provided such are fairly constant.*

It will be seen from what I have said above, that the work of the old systematists is useless to this end. Yet the necessarily strict rule of priority in nomenclature, without which the confusion of names would render systematic Zoology absolutely useless, makes it necessary that these old species should be all re-examined. The types on which many were based, have been completely lost, others are buried in Museums where reference to them is almost impossible, while the residue in the National Collection are either spirit specimens in which all colour characters have been lost, or skin and skull specimens which have been for various periods stuffed and exposed to the light, &c., until they are of but little more use

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

It is clear then, that if any advance in the systematic Mammalogy of India is to be made, not only series of specimens of each animal from each of a great number of different localities, in which the local conditions differ, are necessary but especially so from those localities, whence came the specimens to which names were given by the workers of the last century.

The only chance of obtaining such series of 'topotypes' is a systematic collection by an expert giving his whole time and intelligence to the work. The Bombay Natural History Society, recognising this, has organised a fund to meet the cost of a Mammal 'Survey' of India. Mr. G. C. Shortridge, who has already done good collecting work in Australia, Java, Borneo, &c., has recently left England to take part in this survey. While Mr. Crump, who was on the spot, has already begun work for the Society, the first fruits being the Collection from E. Khandesh with which this paper deals.

It is not expected nor intended that this survey shall cover the whole field of mammalogy in India. Its object, as I have tried to show, is to obtain a solid framework foundation of knowledge on which to build. The desirability of further collections by private individuals will not be lessened but increased, for we shall have obtained data which will enable us to deal with specimens so collected. The observations of Field Naturalists are quite useless, unless they can be associated with the exact name of the animal under observation. I am insisting on this point because several Members of the B. N. H. Society, of which I am myself a Life Member and also one of the earliest recruits, have expressed to me disapproval of the idea of the employment of paid Collectors, which they held would take from private individuals an interesting hobby, whereas if rightly regarded, it will add interest to their hobby. I trust that one result of this survey will be to bring in many recruits to the study of Mammals, and also additional members to our Society.

It has been suggested to me that the preparation and publication of provisional reports of the collections made will be waste of time and money. With this view I cannot agree. If, as I trust, a fair percentage of members come to take an interest in their

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

local mammalia, interim lists (even though provisional) should be useful to them not only as showing what forms have been obtained in any locality dealt with, but also what forms have *not been obtained.* Our Collector, I fear, will not be able to help much with vernacular names, habits or folklore; here residents can help enormously by ascertaining and recording such in the Journal, thus providing material for the Editor when Blanford's Mammalia comes to be revised.

In this and any of the following reports which it may fall to my lot to write, I propose, after careful study of the references, to discuss and deal with the synonymy given by Blanford in his Fauna, the first time any species comes to be considered, but shall not repeat this unless circumstances absolutely require it. Any undoubtedly new species or sub-species (geographical races) I propose to describe separately, if possible, in the same number of the Journal merely giving the name and a reference back in the "Report."

The area in which the present Collection was made lies along the border where the Khandesh District marches with the Nizam's Territory. (The Bats were taken at the Ajanta Caves actually within that Territory.) The boundary, for the most part, is a range of low ghats covered with scrub jungle, the plains above and below being mostly black alluvial soil, growing chiefly cotton and jowari, with occasional patches of babhul forest—noticeably at Ghodasgaum on the Purna River.

The collection is by no means completely representative, it consists of 152 specimens (including 10 in spirit) which I have been able to allot to 27 species in 23 genera.

The monkeys are represented by three specimens of the common Langur. There is no specimen of the common Red Monkey. Of Bats there are eight species mostly of quite common forms, which were dealt with in my paper "Some Konkan Bats" (Vol. XII, p. 716, 1899), one, however, *Taphozous kachhensis*, Dobson, has not, I believe, been recorded since it was first found by Stoliczka forty years ago.

The Insectivores are disappointing, being represented only by 3 Shrews. They are a most difficult group to classify and good

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

series of them are very badly wanted. Of the Tree Shrews (*Tupaia*) and the Hedgehogs there are no specimens. Amongst the Carnivores the Cats are represented by a fine series of what is generally known as *Felis chaus*, a name borrowed from a Caucasian species; the Viverridæ by 3 specimens of the Common Indian Mongoose and the Dogs by specimens of the Striped Hyæna, the Jackal and the Indian Fox, the two former seem to be Genera which vary but little in different localities while the last includes many species; Several other species of each of these 3 Sub-Families are no doubt obtainable in Khandesh. Rodents are more largely represented, but by no means so fully as one could wish, there being no specimens of several small forms which are quite common and widely spread. Among the specimens obtained are some specimens of a Hare which is so distinct a species that I have no hesitation in describing it. Two species were described nearly 100 years ago from "Bengal" and "Malabar" respectively. In 1867 Jerdon stated in his "Mammalia of India" that these two species (*ruficaudatus* and *nigricollis*) occupied the whole of India from the foot of the Himalayas to Ceylon (the former in the North and the latter in the South), the dividing line being the Rivers Tapti and Godavery. The present collection shows that this view is erroneous so far as the Khandesh Hare is concerned. Finally the Ungulates are represented by specimens of Blackbuck and Chinkara; there are no specimens of the Muntjac, Four-horned Deer, or Mouse Deer.

I trust I shall not be misunderstood in emphasising thus some of the lacunæ in this Collection, which I have done in the hope that some resident member may make them good.

I think the Society owes a debt of gratitude to Mr. W. S. Millard and Mr. N. B. Kinnear for the hard work which they have cheerfully put in, in collecting funds for and organising this "Survey." I wish to offer the Society and them my personal congratulations at the very promising results yielded by this the very first collection made, and my thanks for the privilege of being allowed to work out the specimens obtained.

The Collectors' notes, when given, will be found in square brackets at the end of the description of the species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PRESBYTIS ENTELLUS, Dufr.

The Langur.

1797. *Simia entellus*, Dufresne. Bull. Soc. Phil., p. 49.
1843. ? *Semnopithecus anchises*, Blyth. J. A. S. B. XIII, p. 470.
1888. *Semnopithecus entellus*, Blanford. Mammalia No. 12.
♂ 40; ♀ 38, 39. Shendurni, E. Khandesh.

The National Collection is very badly off for specimens of this group. There is nothing which can with confidence be labelled *entellus*, a name based on a Bengal specimen. As however the species is stated to extend to Central India, the name must be used for the present. The forms named *anchises* and *leucopus* are from the Mysore table land and the Malabar Coast respectively, and until authentic representatives are available for examination, we must remain very much in the dark as to the number of distinct forms in this group.

LYRODERMA LYRA, Geoff.

The Indian Vampire Bat.

1810. *Megaderma lyra*, Geoffroy. Ann. Mus. XV., p. 190.
1847. *Eucheira lyra*, Hodgson. J. A. S. B. XVI, p. 891. (Gen. nom. preoccupied.)
1872. *Lyroderma lyra*, Peters. M. B. Akad. Berl., p. 195.
1891. *Megaderma lyra*, Blanford. Mammalia No. 169.
♀ 135, 136. Ghodasgaum, E. Khandesh. in al. 134. Ghodasgaum, E. Khandesh.

In a paper on the Megaderms (A. M. N. H. XIX, 1907, p. 129) Dr. K. Anderson and myself established a sub-species *caurina*. From the material at our disposal we placed the boundary between true *lyra* and *lyra caurina* at longitude 75°-77°. The present specimens, which are undoubtedly true *lyra*, seem to have been taken right on this boundary line.

PIPISTRELLUS CEYLONICUS, Kel.

Kelaart's Bat.

1852. *Scotophilus ceylonicus*, Kelaart. Prod. p. 22.
1878. *Vesperugo indicus*, Dobson. Cat. Chir. B. M., p. 222.
1891. *Vesperugo ceylonicus*, Blanford. Mammalia, No. 186.
♀ 77. Ajanta, Haidrabad Dekhan.

As recorded in my paper "Some Konkan Bats" (B. N. H. S. Journ. XII, p. 719, 1899) this species is quite common all down the West Coast from Surat to Kanara, and I have taken it at Poona. It is undoubtedly *indicus* Dobson, and it is quite possible that when series from Ceylon are available for comparison, Dobson's name will have to be used, *ceylonicus* being limited to the Ceylon form.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PIPISTRELLUS DORMERI, Dobs.

Dormer's Bat.

1875. *Scotozous dormeri*, Dobson. P. Z. S., p. 373.

1891. *Nycticejus dormeri*, Blanford. Mammalia No. 193.

♀ 55, 78, Ajanta in al. ♂ 57, 58. Haidarabad Dekhan.

The type came from Bellary. Mr. Thomas dealt with this species in his paper in our Journal (Vol. XI), 1897, and I gave some notes on it two years later in my paper "Some Konkan Bats" (Vol. XII, p. 718). Later still I found it quite common everywhere. Its resemblance to other pipistrelles no doubt caused it to be overlooked in earlier days.

PIPISTRELLUS MIMUS, Wroughton.

The Southern dwarf Pipistrelle.

1891. *Vesperugo abramus*, Blanford. Mammalia No. 187 (partim).

1899. *Pipistrellus mimus*, Wroughton. Journ. B. N. H. S. Vol. XII, p. 722.

♂ 87 (in al.) . . . Bhodwad, E. Khandesh.

Hitherto only recorded from the Surat District. I have however taken it above Ghats in Khandesh, and at Poona and as far South as Kanara. It is probably widely distributed, but owing to its close resemblance to the common 'V. abramus' (Blanford No. 187) has been overlooked.

SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat.

1822. *Scotophilus kuhli*, Leach. Trans. Linn. Soc. XIII, p. 72.

1891. *Nycticejus kuhli*, Blanford. Mammalia No. 194 (partim).

♂ 74. Ajanta, Haidarabad Dekhan.

♂ 94. Bhodwad, E. Khandesh.

The type of *kuhli* is a quite young specimen of which the type locality is unknown. The synonymy in Blanford's "Mammalia" entirely disappears, thus :—

V. temmincki of Horsfield is a Javan animal of which the British Museum has a fine series, and *castaneus*, Hors. is Malayan. The remaining names represent bats which may be placed in 4 groups by the length of the forearm as follows (F. A. in *kuhli* is 62) :—

1831. *S. heathi*. Horsfield, is the S. Indian form. F. A. 65 and over.

1834. *S. belangeri*, Is. Geoff. = 1851, *luteus*, Bl. = 1851. *flaveolus*, Horsf. F. A. 58.

1897. *S. wroughtoni*, Thos. F. A. 50.

The two specimens sent differ very considerably in coloration, but until series are available, it is impossible to say how much of this variation is individual, sexual, seasonal or racial.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

[I spent one day in the Ajanta Caves looking for bats. There appear to be only two species inhabiting these caves as per specimens obtained. Many thousands find a resting place here, and when alarmed utter shrill screams and a peculiar croaking noise. The sexes were not apart at this time, but as a rule I did not find both species in the same cave. There were no young.—C. A. C.]

SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat.

1897. *Scotophilus wroughtoni*, Thomas. B. N. H. S. Journ. XI. 2, p. 275, ♂ 83. Bhodwad, E. Khandesh.

The type specimen was taken by me in the Surat Dist. Later I obtained specimens on the Coast and Ghats as far south as the Satara Dist. and Mr. Coplestone, I. F. S., took it in Kanara, but this is the first specimen taken so far from the sea.

TAPHOZOUS MELANOPOGON, Temm.

The Black-bearded sheath-tailed Bat.

1841. *Taphozous melanopogon*, Temminck. Mon. Mamm. II., p. 287.

1841. *Taphozous bicolor*, Temminck. l. c., p. 290.

1891. *Taphozous melanopogon*, Blanford. Mammalia No. 218.
♂ 62, 63, 71, ♀ 61, 64, in al. 65, 66, 67. Ajanta Caves, Haidarabad Dekhan.

There is not a good collection of specimens of this species in the British Museum. Within our boundaries it is represented only by two or three isolated specimens, and a fine series taken by Mr. E. Comber in the Kennery Caves.

The type locality of *melanopogon* is the Bantam District in Java. Temminck, however, also described a species *bicolor* from Calcutta, but whether identical or not with the present specimens we need a series from the type locality to decide.

TAPHOZOUS KACHHENSIS, Dobs.

The Cutch sheath-tailed Bat.

1872. *Taphozous kachhensis*, Dobson. P. A. S. B., p. 152.

1891. *Taphozous kachhensis*, Blanford. Mammalia No. 221.
♂ 60, 73. ♀ 59, 70, 72, in al. 69, 75, 76. Ajanta Caves, Haidarabad Dekhan.

The British Museum possesses only one specimen of this bat, a spirit specimen, bleached quite white. While there is no doubt of the correctness of this specific identification of these specimens, it may well be that they are a distinct local race; this however cannot be decided until a topotype series of skin specimens is available for comparison.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PACHYURA SPP.

Shrews.

♂ 47. Shendurni, E. Khandesh.
♀ 53. Fardapur, Haidarabad Dekhan.
♀ 52. Fardapur, Haidarabad Dekhan.

In the present state of our knowledge of the Indian Shrews it is useless to try and assign names to stray specimens. I have given considerable study to the small amount of material available, and the only sure result I have obtained is that all individuals from the plains of India belong to the Genus *Pachyura*, while all Himalayan forms are *Crocidura*. In the present case the coloration of the 2 Fardapur specimens is identical, yet they, I believe, are undoubtedly different species, while No. 47 ♂ from Shendurni is the same species as No. 53 ♀ from Fardapur. This I gather from the proportions of the body and the size of the teeth.

FELIS AFFINIS, Gray.

The Jungle Cat.

1830. *Felis affinis*, Gray and Hardwicke. III, Ind. Zool. I., pl. 3.
1832. *Felis kutas*, Pearson. J. A. S. B. I, p. 75.
1836. *Felis (Lynchus) erythrotus*, Hodgson. J. A. S. B. v, p. 233.
1844. *Felis jacquemontii*, I. Geoffroi. Jacq. Voy., IV, p. 58.
1888. *Felis chaus*, Blanford. Mamalia No. 41.

♀ 8. Jalgaum, E. Khandesh.
♀ 138. Ghodasgaum, E. Khandesh.
♂ 45, 49, ♀ 41. Shendurni, E. Khandesh.
♀ 68. Fardapur, E. Khandesh.
♂ 102, ♀ 95. Edalabad, E. Khandesh.

Local name—*Ran Billi.*

Felis chaus was described from the Caspian Sea. In 1898, Mr. de Winton studied this group of Cats and recognised 3 subspecies of *chaus*, viz., *nilotica* and *furax*, from Egypt and Palestine respectively, and *affinis* from India. The two former are at once distinguishable by their teeth, which are much larger and stouter than in true *chaus*. Mr. de Winton distinguishes *affinis* from typical *chaus* by "its rather longer tail, bright fox-red ears, and lighter build." He adds "The skull is narrower and the teeth are not nearly so heavy." I have measured the upper carnassial in a specimen from the Caucasus, and find it to be 15 × 7·5.

In two specimens from Persia and Seistan these dimensions are practically the same, in a specimen from Gangutri, the type locality of *affinis*, these dimensions are 13 × 6. In a series of skulls from the Punjab, Rajputana, Central India, Khandesh, Poona, Nepal, &c., I have not found one with a larger carnassial than this, while some are appreciably smaller. There can be no sort of doubt that the Indian form is quite distinct from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the typical *chaus*, from the Caspian Sea, and I cannot see any advantage in perpetuating the name *chaus* for the Indian form.

The type locality of *affinis* is Gangutri while the type of *jacquemontii* came from Kedernath,—Hodgson's *erythrotus* is the Nepal form, while *kutas* was described by Pearson from Midnapur.

Gangutri and Kedernath are so close to one another that we may fairly assume that *affinis* and *jacquemontii* are the same animal, most probably its range extends to the highlands of Nepal, and thus it is also identical with *erythrotus*. Whether the lowland Nepal form is different from *affinis*? and is or is not the same as *kutas* from *Midnapur*? and whether *kutas* represents the Madras form? or whether the last is again different? are questions which must be left to be solved, it is to be hoped, by the later collections of this Survey.

[SHENDURNI.—The Betel leaf is much grown here in gardens enclosed in walls of grass tattis frequently 15 ft. high. These gardens, which are almost incessantly watered by canals and frequently surrounded by plots of bananas, make excellent and cool cover for Cats and Jackals. I posted myself in a convenient spot and had excellent views of the Cats that were driven out, among which were specimens 41, 45 and 49. When being driven and so long as there is cover the Cat exhibits no haste or fear but moves with the utmost stealth and caution, a splendid example of the art of concealment. These Cats live on small birds, rats and also fowls which they will seize within sight of the owner, as a rule about sunset, and during the day they lie up in these gardens, in hedges or in trees. They will not leave their hiding place until compelled—C. A. C.]

MUNGOS MUNGO, Gmel.

The Common Indian Mungoose.

1788. *Viverra mungo*, Gmelin. Syst. Nat. I., p. 84.
1792. *Viverra nems*, Kerr. Anim. Kingd., p. 160.
1812. *Ichneumon edwardsi*, Geoffroy. Descr. Egypt, p. 139.
1812. *Ichneumon griseus*, Geoffroy. l. c.
1823. *Herpestes frederici*, Desmarest. Dict. Sc. Nat. XXIX, p. 69.
1829. *Herpestes malaccensis*, Fischer. Syn. Mamm., p. 164.
1836. *Mangusta (Herpestes) nyula*, Hodgson. J. A. S. B. V., p. 236.
1841. *Herpestes pallidus*, Wagner. Schreb. Saug. Supp. II., p. 311.
1888. *Herpestes mungo*, Blanford. Mammalia No. 60.

♀ 9. Parola, E. Khandesh.
♂ 36. Shendurni, E. Khandesh.
♂ 54. Fardapur, Ajunta, E. Khandesh.

The type locality of *mungo* is not expressly stated by Gmelin, but as the name is based on the Portuguese name of the animal, we may fairly accept the southern West Coast as such.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

[SHENDURNI.—Here, as in the other parts of Khandesh that I have visited Mongooses appear to be by no means common. My experience of the Mongoose is that if he is about he will soon show himself running boldly in the open near native huts and round stacks. I enquired everywhere and the local men immediately offer to show me some but rarely succeed and express wonder that on that particular morning or evening no mongoose showed himself. Of course it might be that while I am watching one side of a wall or stack the Mungoose is on the other, but this is unlikely to be always the case. I have seen several in the neighbourhood and on some cultivated land about a mile from human habitation.—C. A. C.]

HYÆNA HYÆNA, L.

The Striped Hyæna.

1758. *Canis hyæna*, Linnæus. Syst. Nat. X., Edn., p. 40.
1780. *Hyæna striata*, Zimmermann. Geog. Gesch. II., p. 256.
1888. *Hyæna striata*, Blanford. Mammalia No. 66.
♂ 149, 153 ; ♀ 133. Ghodasgaum, E. Khandesh.

Local name—*Tarras.*

Mr. Thomas has recently pointed out (P. Z. S. 1911, p. 134) that *hyæna*, L., must be used for *striata*, Zimm. The type came from the Benna Mountains near Bunder Abbas in the Persian Gulf. In the absence of a topotype I have compared this series with specimens from Smyrna, Aden, and Somaliland, and can find no marked difference. Somali specimens do not seem to have the dorsal crest blackened to the same extent as the others. Indian specimens seem to have the teeth a trifle stouter.

CANIS AUREUS, L.

The Jackal.

1758. *Canis aureus*, Linnæus. Syst. Nat. X. Ed., p. 40.
1833. *Canis aureus indicus*, Hodgson. As. Res. XVIII., p. 237.
1888. *Canis aureus*, Blanford. Mammalia No. 69.
♀ 31. Bhadgaum, E. Khandesh.
♀ 37. Shendurni, E. Khandesh.
♂ 56. (imm.) Fardapur, E. Khandesh.
♂ 82. (no skull) Jamner, E. Khandesh.
♂ 155. ♀ 139. (no skull) Ghodasgaum, E. Khandesh.

Local name—*Koela.*

Linnæus' name was based on a description and picture by Koempfer of an animal he found on the Benna Mountains in the Province of Lar, S. Persia. The Society has only recently been able to obtain two good specimens from Bunder Abbas which may be taken as typical *aureus*. The present specimens are distinguishable from the typical by skull and tooth characters, but whether they are so from *indicus*, Hodgson, cannot be decided until Bengal specimens are available for comparison.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

VULPES BENGALENSIS, Shaw.

The Indian Fox.

1800. *Canis bengalensis,* Shaw. Gen. Zool. I., p. 330.
1831. *Canis kokree,* Sykes. P. Z. S., p. 101.
1833. *Canis rufescens,* Gray and Hardwicke. III. Ind. Zool. II., p. 3.
1833. *Canis (Vulpes) indicus,* Hodgson. As. Res. XVIII. pt. 2, p. 237.
1837. *Vulpes hodgsonii,* Gray. Charl. Mag. N. H. 1, p. 578.
1888. *Vulpes bengalensis,* Blanford. Mammalia No. 72.

♂ 32. ♀ 30. Bhadgaum, E. Khandesh.

Local name—*Koka.*

The present specimens undoubtedly represent *Canis kokree,* Sykes, whose type locality was "Dukhun," but whether they are separable from *rufescens* and true *bengalensis* there is no sufficient material available to me on which to decide.

The first and last three synonyms, above, probably represent the same animal, unless the Fox of the United Provinces is different from that of Bengal in which case *rufescens* must be used for the former.

JALGAON.—I also put up a Fox, reddish in colour and with a very pronounced white tip to his tail, after consulting "Blanford" I presume this must have been *Vulpes leucopus,* it appeared larger than No. 30 which was collected later.

I met Mr. Jenkins (Police Superintendent) here (Fardapur), and he asserts that he has occasionally in Khandesh observed foxes with the tails tipped white which bears out my own observation.

[WADGAON AND BHADGAON.—On an isolated hill I trapped a fox and from the condition of the mammæ I judged she had just reared a litter of cubs, so the "earth" which had two openings was opened and found to be about 5 feet long, both passages leading to the nest; however, it contained no cubs, so I had a further look round and found another "earth" on the opposite side of the hill, I concluded this was the bore of the ♂ and perhaps where the cubs had hidden, so trapped and caught one cub. The "earth" had 6 outlets and several runs from 4 to 6 ft. long and all but one converging to a centre chamber, one run started from the centre and going straight for a few feet turned sharply into a hollowed out chamber. The earth was empty except for the remains of a hare.—C. A. C.]

FUNAMBULUS PENNANTI, Wrought.

The Common Five-striped Squirrel.

1891. *Sciurus palmarum,* Blanford. Mammalia No. 253 (part).
1905. *Funamulus pennanti,* Wroughton. Journ., B. N. H. S., p. 411.

♂ 2, 3. Parola, E. Khandesh.
♀ 34, 35. Pachora, E. Khandesh.
♀ 46, (no skull). Shendurni, E. Khandesh.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♀ 92, 93. Bhodwad, E. Khandesh.

♂ 141, 145, 152, ♀ 143, 144. Ghodasgaum, E. Khandesh.

Local name—♂ *Kargoota*, ♀ *Kargooti*.

I obtained the type of this species in the Mandvi Taluka of Surat, and at the same time a specimen of *palmarum*. All the specimens now sent are typical *pennanti*, it seems that *palmarum*, the southern form, runs up further north in the Konkan than above Ghats.

[SHENDURNI.—Palm squirrels are plentiful everywhere and the specimen No. 46 had a nest composed of sticks and grass and lined with cotton hair and bits of rag. I was watching the movements of these squirrels one day and noticed that they drove all crows from the ground near their particular tree, but made no attack upon doves which were feeding along with the crows and moreover the doves made no attempt to move while this was going on.—C. A. C.]

TATERA INDICA, Hardw.

The Indian Gerbil.

1807. *Dipus indicus*, Hardwicke. Linn. Trans. VIII, p. 279.

1891. *Gerbillus indicus*, Blanford. Mammalia No. 264 (part).

1906. *Tatera indica*, Wroughton. A. M. N. H. XVII, p. 497.

♂ 1. Jalgaum, E. Khandesh.

♂ 4, 5, 6, 14, 16, 17, 20; ♀ 11, 12, 13, 15, 18, 21. Parola, E. Khandesh.

♂ 22, 29; ♀ 23, 24, 28. Bhadgaum, E. Khandesh.

♀ 44. Shendurni, E. Khandesh.

♂ 80 (imm.) Jamner, E. Khandesh.

♀ 88 (imm.) Bhodwad, E. Khandesh.

♂ 100, 101. Edalabad, E. Khandesh.

Local name—♂ *Undir*; ♀ *Undiri*.

The type locality of *indicus* is not exactly known but all Hardwicke's names are based mainly on specimens from the United Provinces. Blanford includes *cuvieri*, Waterhouse, in the synonymy of *indicus*, but it is a quite well marked distinct species, known only from the extreme south of Madras (Tinniveli, Madura) until quite recently, when the British Museum received specimens from Mr. G. S. Hardy, I.C.S., taken in the Ratnagiri District.

[Gerbilles, as specimens herewith, are very common here. The entrance to the burrow is as a rule very large and very distinct, paths perfectly straight, lead from one burrow to another and out towards the feeding grounds, these must be traversed a great many times every night for the grass is often completely away. The Bhils dig these rats out regarding them as an article of food and as the flesh is rather white and sweet smelling I have no doubt they are good eating. The burrows I dug out

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

were circular in design covering a space in diameter from 4 to 5 yards, the runs are in much the same plane as a rule about 12 or 18 inches below the surface, many terminating in store chambers but containing very little grain now. Mr. Simcox informs me that during the last famine the Bhils made a practice of opening up these store chambers for the sake of the grain stowed away.—C. A. C.]

EPIMYS RUFESCENS, Gray.

The Common Indian Rat.

1837. *Mus rufescens*, Gray. Charl. Mag. N. H. I., p. 585.

1891. *Mus rattus*, Blanford. Mammalia No. 272 (part).

♀ 19. Parola, E. Khandesh.

♂ 25, 27 (imm.) ♀ 26. Bhadgaum, E. Khandesh.

♂ 150; ♀ 106. Ghodasgaum, E. Khandesh.

Without protracted study of material, which at present is not available, it is impossible to sort out the synonymy given by Blanford under "*Mus rattus*." The earliest available name for Indian *rattus* however is *rufescens*. Gray, in his description, records that the tail is shorter than the head and body, a statement which was based on a stuffed specimen in the Indian House Museum; this type specimen is now in the National Collection and has been unstuffed and the tail is certainly *not* shorter than the head and body. There are specimens in the British Museum from the United Provinces, and I have taken others at Dharwar which agree quite fairly with the present series. The most convenient course, therefore, is to accept, *rufescens* provisionally as the name of the Indian form of *rattus*.

MUS MUSCULUS, L.

The Common House Mouse.

1766. *Mus musculus*. L. Syst. Nat. XII, p. 83.

1891. *Mus Musculus*, Blanford. Mammalia No. 282 (part).

♀ 7. Parola, E. Khandesh.

The present specimen is a rather young individual and comes undoubtedly of imported stock.

I have not gone into the synonymy given by Blanford which is extremely complicated; it will be time enough when we have some series of Indian forms to deal with.

LEGGADA PLATYTHRIX, Benn.

The Dekhan Spiny Mouse.

1832. *Mus platythrix*, Bennett. P. Z. S., p. 121.

1839. *Mus saxicola*, Elliot. Madr. Journ. L. & S. X., p. 215,

1854. *Mus spinulosus*, Blyth. J. A. S. B. XXIII., p. 734.

1891. *Mus platythrix*, Blanford. Mammalia No. 289.

♂ (imm.) 97; ♀ (no skull) 96. Edalabad, E. Khandesh.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Bennett's type specimen was collected by Col. Sykes in "Dukhun," probably at or near Poona, *saricola*, Elliot, from Dharwar, and *spinulosa*, Blyth, from Punjaub are probably separable forms. It is unfortunate the present specimens are such poor ones, a good series from Khandesh would have been of great value.

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

1837. *Leggada booduga*, Gray. Charl. Mag. N. H. I., p. 586.
1839. *Mus lepidus*, Elliott. Madr. Mag. L. and S. X., p. 216.
1851. *Mus terricolor*, Blyth. J. A. S. B. XX, p. 172.
1852. *Mus fulvidiventris*, Blyth. J. A. S. B. XXI, p. 351.
1852. *Mus albidiventris*, Blyth. l. c.
1866. *Mus beavanii*, Peters. P. Z. S., p. 559.
1891. *Mus booduga*, Blanford. Mammalia No. 287.
♀ 48. Shendurni, E. Khandesh.
♀ 86, 90. Bodvad, E. Khandesh.
♂ 108, 147, 148; ♀ 103, 151. Ghodasgaum, E. Khandesh.

The type of *booduga* was taken by Elliot in Dharwar District and is certainly the same as *lepidus*, Elliot, *terricolor*, Blyth, came from the same locality and is also probably identical; *fulvidiventris*, Blyth, came from Trincomalee. I took some specimens at Ootacamund which seem to answer to Blyth's description, and which are, I think, a variety of *Mus musculus*; *albidiventris* and *beavani* came from Calcutta and Manbhoom respectively and are probably identical, but whether they are distinct from *booduga* or not, there is no sufficient evidence to decide. Pending receipt of topo-type series of *booduga* with which to compare them I rank them as *booduga*. The British Museum has a series of '*booduga*' from Ahmednagar collected by the Rev. Mr. Fairbank from which the present specimens do not seem to differ to any appreciable extent.

MILLARDIA MELTADA, Gray.

The Soft-furred Field Rat.

1837. *Golunda meltada*, Gray. Charl. Mag. N. H. I., p. 568.
1839. *Mus mettada*, Elliot. Mad. Journ. L. and S. X p. 94 (no description).
1839. *Mus lanuginosus*, Elliot. l.c. p. 212.
1891. *Mus mettada*, Blanford. Mammalia, No. 290.
1911. *Millardia meltada*, Thomas. Journ. Bom. N. H. S. XX, p. 990.
♂ juv. 85, ♀ juv. 89. Bhodvad, E. Khandesh.
♀ 104. Godasgaum, E. Khandesh.

In his original description, Gray gives the type locality as "Inhabits Bombay," but in the same paper he also describes *Golunda elliotii*, and *Leggada booduga*, assigning to them the same type locality.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The use of Elliot's name and the fact that most of these names are based upon Kanarese words, shows clearly that the species were based on Elliot's specimens, and we may therefore confidently accept Elliot's statement that they all came from the "Mulnad," in Dharwar District. In Vol. XVII, 1907, I described in this Journal (p. 998) 2 species, *comberi* and *listoni* of this genus, from Nasik and Colaba respectively.

I have since been convinced that some of the Nasik specimens, which I then thought might be true *meltada*, are nothing of the sort, but are *comberi*. Both *comberi* and *listoni* have comparatively coarse, harsh hair, while true *meltada* has it very silky and soft.

Unfortunately only one of the specimens in this collection is adult, but it is enough to show that it belongs to the soft haired *meltada* group and not to the more harsh haired *comberi* from the adjoining district of Nasik. Specimens in the British Museum collected by the Rev. Mr. Fairbank at Ahmednagar show that in that District too, the *meltada* type is the representative of the genus.

GUNOMYS KOK, Gray.

The Southern Mole-Rat.

1837. *Mus kok*, Gray. Charl. Mag. N. H. I., p. 585.

1839. *Mus* (*Neotoma*) *providens*, Elliot. Madr. Journ. L. and S. X, p. 210.

1891. *Nesocia bengalensis*, Blanford. Mammalia No. 295 (part).

1908. *Gunomys kok*, Wroughton. Journ. B. N. H. S. XVIII, p. 747.

♂ 10. Parola, E. Khandesh.

♂ 111, 112 juv., 113 juv., 116, 117, 118, 119 juv., 120 juv., 123 juv., 124, 125, 126, 127, 128 juv., 129, 131 juv.

♀ 109, 110, 115, 121 juv., 122 juv., 130, 132 juv., Godasgaum, E. Khandesh.

Local name—*Mugair*.

The types of both *kok* and *providens* were taken by Elliot at or near Dharwar.

I dealt with this species in this journal quite recently (l. c. supra). This series seems to show no important variation from Ahmednagar specimens.

GOLUNDA ELLIOTI, Gray.

The Indian Bush Rat.

1837. *Golunda ellioti*, Gray. Charl. Mag. N. H. I., p. 585.

1839. *Mus golundi*, Elliot. Madr. Journ. L. and S. X., p. 94 (no description).

1839. *Mus hirsutus*, Elliot. l. c. p. 213.

1876. *Pelomys watsoni*, Blanford. P. A. S. B., X. p. 181.

1891. *Golunda ellioti*, Blanford. Mammalia No. 299.

♀ 42. Shendurni, E. Khandesh.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♀ 79, Jamner, E. Khandesh.
♂ 84. Bhodvad, E. Khandesh.
♂ 146. Ghodasgaum, E. Khandesh.

Gray gives the type locality as "Bombay," but as I have pointed out under *M. meltada* there is no doubt that the type came from the Dharwar District and *golundi* and *hirsutus* of Elliot are true synonyms.

Mus myothrix of Hodgson of which the type is in the British Museum (a mutilated flat skin) will, when again found, probably prove to be a distinct species.

Pelomys watsoni, Blanford, is based on 2 specimens "from the southern extremity of the Khirthar range, about 50 miles north-west of Kotri." The British Museum possesses 2 skin specimens from the Habb Valley, when a series of topotypes are available it will probably be found that Blanford's name must be revived for the Sind form of *ellioti*. The British Museum has a specimen of *coffœus* furnished by Kelaart himself which shows that the Ceylon form is distinct from *ellioti*; *newera* may or may not be the same as *coffœus*, but it is certainly distinct from *elliotti*. The type localities of *coffœus* and *newera* are Kandy District and Newara Eliya respectively.

Hystrix leucura, Sykes.

The Indian Porcupine.

1831. *Hystrix leucurus*, Sykes. P. Z. S., p. 103.
1833. *Hystrix cristata indica*, Gray and Hardwicke. Ill. Ind. Zool. II. pl. 14.
1851. *Hystrix zeylonensis*, Blyth. J. A. S. B. XX, p. 171.
1865. *Hystrix malabarica*, Sclater. P. Z. S., p. 353.
1891. *Hystrix leucura*, Blanford. Mammalia No. 315.

♂ 104*a*, 105 (imm.), 107 (imm.). Ghodasgaum, E. Khandesh.

Local name—*Sail.*

Sykes described *leucura* from "Dukhun." Good adult skulls of the common porcupine are a great desideratum, but skins are not of great value.

[Ghodasgaon.—I have done a good deal of tramping to find Porcupine's earths but find that all those anywhere near the village have been smoked out, this is done by a wandering tribe called Jinga Bhui. Damp grass is ignited and pushed as far in the hole as possible and the aperture then closed up till the Porcupines are suffocated when a man crawls in and fetches out the animals. There were none of this tribe near Ghodasgaon at this time and the Bhils would not do the work. Nearly all the Porcupines' earths I have seen have had four or five entrances, two or three openings being very large and the rest much smaller, a great quantity of earth is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

thrown up and the entrances are frequently strewn with bones and dropped Sambur or Chital horns which are much gnawed by the Porcupines. In one case I found a Porcupine's hole in a perpendicular bank and in order to get to the upper level more easily the animals had dug a trench, the extraordinary part about it was that the channel had been dug so clean and square as to give the idea that spades had been used for the purpose, other pathways had been cut, but with less precision. I find Porcupines are easily taken in the ordinary Dorset or Gin traps but the traps I was using, being rather small, the full grown Porcupines always got away by either bending the trap jaws or by merely pulling the foot out leaving behind a toe and a good deal of skin which appears to slide easily from the foot; in one case the entire foot was left in the trap. Only well padded jaws will hold the young, the skin and bones are so soft that a toothed trap cuts right through. I found a path well trodden by Porcupines leading to the river so dug a pit near the water and watched for several nights. The moon was young and having seen nothing I had to return to camp about mid-night, only to find on the following mornings that Porcupines had been to drink water after I had left. Later on I sat up all night and found they came to the water about 3-30 to 4 a.m. but the moon having gone down they were very difficult to see. I could hear one rattling his quills and could just make him out with spines erect looking like a great prickly ball and surrounded by a family of young pigs. I tried a shot with surprising results for besides slaying the Porcupine I must have peppered several young pigs for with terrific squeals they rushed about cannoning violently into each other and with the old boar and sow, making no attempt at first to clear off. I did not feel particularly comfortable in my hollow 20 yards away. I have no doubt the Porcupine was responsible for some of the noise because I have since found that when hit he squeals very much like a pig. The Shikari here asserts that the hollow quills in the tail are used for carrying water to the young.—C. A. C.]

LEPUS SIMCOXI, Wrought.

The Khandesh Hare.

1912. *Lepus simcoxi*, Wroughton. Journal, B. N. H. S., supra p. 338.

♀ 51. Fardapur, E. Khandesh.

♂ 98 ; ♀ 99 (type). Edalabad, E. Khandesh.

♀ 142 ; ♂ 137. Ghodasgaum, E. Khandesh.

This Hare differs markedly in appearance from any other Indian Hare. The grey nape so different from the black of *nigricolls* and the fulvous of *ruficaudatus* catches the eye at once. The blue black scut too is in strong contrast to the brown of the other two species.

The type No. 99 has been presented to the National Collection.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ANTILOPE CERVICAPRA, L.

The Black-buck.

1766. *Capra cervicapra*, Linnæus. Syst. Nat., p. 96.
1850. *Antilope bezoartica*, Gray. P. Z. S., p. 117.
1891. *Antilope cervicapra*, Blanford. Mammalia No. 357.
♂ 91. Bhodwad, E. Khandesh.
♂ 104*a*. Ghodasgaum, E. Khandesh.

GAZELLA BENNETTII, Sykes.

The Indian Gazelle.

1831. *Antilope bennettii*, Sykes. P. Z. S., p. 104.
1842. *Gazella christii*, Blyth. J. A. S. B. XI, p. 452.
1844. *Antilope hazenna*, Is. Geoffroy. Jacq. Voy. Ind. IV., p. 74.
1891. *Gazella bennettii*, Blanford. Mammalia No. 359.
♂ 81. Jamner, E. Khandesh.
♀ 43. Shendurni, E. Khandesh.

These specimens no doubt represent true *bennettii*; Blyth's *christii* came from Cutch or S. Sind and Geoffroy's *hazenna* from Malwa. Whether they are distinct forms I have no specimens on which to base an opinion.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA." SERIES IV, PART III.

By

Sir George F. Hampson, Bart., F.Z.S., F.E.S.

(Continued from page 1083 of Volume XX.)

Genus Bryophila. *Type.*

Pœcilia, Schrank, Fauna Boica ii (2). p. 157 (1802), nec. Bl. Sch. Pisces 1801 .. .. *muralis.*

Bryophila, Treit. Schmett. Eur. v (1), p. 57 (1825) .. *muralis.*

Metachrostis, Hübn. Verz., p. 204 (1827) .. .. *muralis.*

Euthales, Hübn. Verz., p. 205 (1827) .. .. .. *algæ.*

Cryphia, Hübn. Verz., p. 205 (1827) .. .. .. *receptricula.*

Jaspidea, Hübn. Tent., ined .. .. *algæ.*

A. Forewing with the postmedial line minutely dentate or waved.

a. Forewing with the claviform filled in with whitish.

a^1. Forewing with the medial shade interrupted in submedian interspace .. .. .. *nilgiria.*

b^1. Forewing with the medial shade not interrupted in submedian interspace.

a^2. Forewing with the antemedial line oblique .. *albiclava.*

b^2. Forewing with the antemedial line erect .. *poliophæa.*

b. Forewing with the claviform not filled in with whitish.

a^1. Hindwing with the ground-colour yellow .. *deceptura.*

b^1. Hindwing with the ground-colour not yellow.

a^2. Forewing with the cilia chequered white and blackish.

a^3. Forewing with the postmedial line incurved at discal fold .. .. .. *lichenea.*

b^3. Forewing with the postmedial line not incurved at discal fold .. .. *literata.*

b^2. Forewing with the cilia not chequered white and black.

a^3. Forewing ochreous suffused with fuscous.

a^4. Hindwing wholly suffused with brown .. *modesta.*

b^4. Hindwing white, the terminal area suffused with brown .. .. .. *ochrophæa.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

*b*³. Forewing more or less tinged with green or olive .. .. *virescens.*

B. Forewing with the postmedial line not dentate or waved.

a. Forewing with the postmedial line oblique or slightly incurved below vein 4 .. .. *ravula.*

b. Forewing with the postmedial line strongly incurved below vein 4 .. .. .. *ochrota.*

1976. BRYOPHILA NILGIRIA.

1976*a*. BRYOPHILA ALBICLAVA.

Bryophila albiclava, Hmpsn., Cat. Lep. Phal. B. M. vii, p. 622, pl. 122, f. 11 (1908).

♀. Head and thorax white; palpi and antennæ blackish; frons with black patch; tegulæ and patagia edged with black; legs irrorated with brown, the tarsi blackish ringed with white; abdomen pale-yellowish brown. Forewing white with a faint bluish tinge and sparsely irrorated with black-brown; subbasal line black, double, waved, extending to inner margin, with black-brown suffusion before and beyond it on costa; antemedial line double oblique, waved, the inner line interrupted; claviform white defined by black; orbicular and reniform large, white defined by black except above, the former with black-brown centre defined by black, round, conjoined to antemedial line, the latter with small black lunule on inner side of centre; medial area black-brown to the indistinct curved minutely waved medial line; postmedial line double, slightly bent outward below costa, then dentate, excurved to vein 4, then strongly incurved, the costal area beyond it black-brown with some white points on costa; subterminal line black-brown, angled outwards above and below vein 6, incurved at discal fold to postmedial line, slightly excurved at middle, then angled inwards at submedian fold and outward at vein 1; a terminal series of small black lunules; cilia chequered black-brown and white. Hindwing white tinged with reddish brown; a faint discoidal spot, curved postmedial line, and diffused subterminal band; a terminal series of slight dark lunules; the underside white tinged with brown, the costal and terminal area irrorated with brown, a blackish discoidal spot and faint curved postmedial line.

Habitat.—KASHMIR, Gorrais Valley. *Exp.* 36 mill.

1976*b*. BRYOPHILA POLIOPHÆA.

Bryophila poliophœa, Hmpsn., Cat. Lep. Phal. B. M. vii, p. 622, pl. 122, f. 12 (1908).

Head and thorax whitish mixed with olive-brown and irrorated with black; palpi blackish, the extremity of 2nd joint white; antennæ black; tegulæ and patagia edged with black; tarsi blackish ringed with white; abdomen grey-white suffused with brown. Forewing whitish tinged with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pale olive-green and irrorated with fuscous; subbasal line black defined by white on outer side, oblique, waved, from costa to vein 1, with a small black spot beyond it in cell and some fuscous suffusion on costal and inner areas; antemedial line double, black filled in with white, the lines well separated and the inner line indistinct, slightly sinuous; claviform pale defined by black, with a short white streak defined by black above its extremity on median nervure; orbicular, a minute black annulus; reniform an oblique black bar; traces of an oblique minutely waved black line from lower angle of cell to inner margin; the medial area suffused with fuscous; postmedial line double filled in with whitish, slightly bent outwards below costa, then minutely waved, obliquely excurved to vein 4, then strongly incurved, some fuscous suffusion beyond it on costal area with white points on costa; subterminal line very indistinct, blackish, minutely waved, angled outwards at vein 7 and incurved at discal fold and below vein 3; a terminal series of minute black lunules; cilia chequered brownish-white and fuscous. Hindwing whitish uniformly suffused with brown; a faint discoidal spot and curved postmedial line; a slight dark terminal line; cilia white faintly tinged with brown, the underside brownish white with some dark irroration on terminal area, a black discoidal spot and somewhat diffused curved postmedial line.

Habitat.—KASHMIR, Chamba, Kardrug. *Exp.* 30 mill.

1978. BRYOPHILA DECEPTURA.

Diphtera deceptura, Wlk. XXXII, 614 (1865).

Bryophila postochrea, Hmpsn., Ill Het. B. M. ix, p. 95, pl. 161, f. 8, (1893).

1975. BRYOPHILA LICHENEA.

1972. BRYOPHILA LITERATA.

1973. BRYOPHILA MODESTA.

1973*a*. BRYOPHILA OCHROPHÆA.

Bryophila ochrophœa. Hmpsn. Cat. Lep. Phal. B. M. vii, p. 631, pl. 122, f. 21 (1908).

Head and thorax brownish-white slightly irrorated with brown; palpi with blackish patch on 2nd joint; tarsi banded with blackish; abdomen ochreous white with faint dorsal brown bands, the ventral surface white. Forewing brownish-white irrorated with black-brown; subbasal line represented by blackish bars from costa and cell with dark marks beyond it on costa, in cell, and above inner margin; antemedial line blackish indistinctly double except towards costa, waved, almost erect, a band of thick dark irroration beyond it; orbicular and reniform with blackish centres and slight dark outlines, the former small, round, the latter somewhat constricted at middle; an indistinct waved medial line from cell to inner margin; postmedial line with small black spot at costa, slightly bent outwards below costa and incurved at discal fold, incurved and some-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

what dentate below vein 4; subterminal line only defined by a band of dark irroration on its inner side, excurved below vein 7 and at middle and incurved at discal and submedian folds; a terminal series of black striæ. Hindwing white faintly tinged with brown; cilia pure white; the underside white faintly tinged with brown.

Habitat.—KASHMIR, Dras. *Exp.* 24-30 mill.

1974. BRYOPHILA VIRESCENS.

1974*a*. BRYOPHILA RAVULA.

Noctua ravula, Hübn. Eur. Schmett. Noct. f. 461 (1818); Staud. Cat. Lép. Pal., p. 166.

,, *lupula*, Hübn. Eur. Schmett. Noct. f. 573 (1818); Dup. Lép. Fr vii., p. 367, pl. 122, f. 6 and Suppl. iv., pl. 69, f. 4; Frr. Neue. Beitr. pl. 170 ff. 4-5; Herr. Schäff. Eur. Schmett. Noct. f. 86.

Bryophila ereptricula, Treit. Schmett. Eur. (I), p. 66, (1825); Dup Lèp. Fr. vii, p. 236, pl. 115, f. 4; Frr. Beitr. pl. 84, ff. I, 2 and pl. 129; id. Neue. Beitr. pl. 52, f. 2; Boisd. Icones., pl. 71, f. 5.

,, *troglodyta*, Frr. Neue. Beitr. I, p. 102, pl. 52, f. 1 (1833).

,, *vandalusiæ*, Dup. Lèp. Fr. Suppl. iv., p. 405, pl. 82, f. 9 (1842); Herr. Schäff. Eur. Schmett. Noct. f. 569; Rmbr. Cat. Lèp. S. Aud., pl. 6, ff. 1-2.

Head and thorax greyish mixed with red-brown and fuscous; palpi blackish, white at base; frons with lateral black bars; pectus and legs whitish mixed with black, the tarsi blackish tinged with white, abdomen whitish suffused with brown, the crests black. Forewing red-brown with some dark irroration, some whitish at base of inner margin; the antemedial area and costal area to postmedial line suffused with fuscous and irrorated with grey, some whitish suffusion beyond postmedial line; subbasal line double, curved, from costa to vein 1, above which there is a whitish patch beyond it; antemedial line double, somewhat inwardly oblique, and bent inwards to inner magin, the inner line slightly angled inwards in submedian fold; claviform represented by a slight brown striga at extremity; orbicular defined by black, elliptical; reniform with greyish centre slightly defined by black, and whitish annular slightly defined by black, constricted at middle; an oblique dark striga from middle of costa and faint incurved line from lower angle of cell to inner margin; postmedial line double filled in with whitish, the outer line indistinct, bent outwards below costa, excurved to vein 4, then incurved and slightly excurved at vein 1; the postmedial costal area blackish with oblique outer edge, and some grey points on costa; an indistinct minutely waved brown subterminal line, excurved below vein 7 and at middle; a black shade before termen from below apex to vein 3; a fine black terminal line;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

cilia grey and fuscous with a dark line through them. Hindwing white, the veins and terminal area tinged with brown; cilia white, tinged with brown at apex and with slight brown marks at middle; the underside white; the costa and terminal area to vein 2 irrorated with brown, a small discoidal spot and sineous postmedial line.

ab. 1. *ereptricula.* Forewing darker, the basal area diffused with white, the terminal area with diffused white spots towards costa and tornus.

ab. 2. *vandalusiæ.* Forewing much greyer; hindwing white in male. Spain, Asia Minor, Mesopotamia.

ab. 3. Similar, but forewing with the antemedial area rufous. Syria.

Habitat.—EUROPE; ALGERIA; ASIA MINOR; SYRIA; MESOPOTAMIA; KASHMIR, Dana. *Exp.* 24-30 mill.

Larva.—Kirby, Butt. and Moths. Eur. p. 160; Hffm. Raup., p. 77.

Blue with a black dorsal line and yellowish red lateral stripe defined below by black. Food plants: Lichens on Walls. 5-6.

1974*b*. BRYOPHILA OCHROTA.

Bryophila ochrota, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 641, pl. 122, f. 27 (1908).

Head and thorax white tinged with brown; 2nd joint of palpi with blackish patch at sides; tarsi banded with blackish; abdomen ochreous white with dorsal brownish bands. Forewing ochreous white mostly suffused with brown and irrorated with fuscous, the medial area rather darker; subbasal line indistinctly double filled in with whitish and with some rufous scales on it, from costa to submedian fold; antemedial line indistinctly double filled in with whitish and with some rufous on outer line, bent inwards to costa, then minutely waved; claviform with its extremity faintly defined by blackish; orbicular and reniform with brownish centres and slight whitish annuli faintly defined by blackish, the former round, the latter somewhat constricted at middle; traces of a waved medial line from cell to inner margin; postmedial line double filled in with whitish, some rufous on the inner line, bent outwards below costa, strongly excurved to vein 4, then strongly incurved, some white points beyond it on costa; traces of a pale minutely waved subterminal line below vein 3; a terminal series of minute dark lunules defined on inner side by slight pale lunules; cilia with a slight whitish line through them. Hindwing white, faintly tinged with brown; cilia pure white; the underside white faintly tinged with brown.

Habitat.—KASHMIR, Dras; BELOOCHISTAN, Quetta. *Exp.* 26 mill.

Genus IAMBIA.

	Type.
Iambia wk, xxvii. 109 (1863)	*inferalis.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to middle of frons and moderately scaled, the 3rd moderate; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed chiefly with scales, the prothorax without crest, the metathorax with spreading crest; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rounded, the termen very slightly crenulate and somewhat excised from vein 3 to tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with two of the terminal points confluent and forming a lunule at discal fold.
  a. Forewing with small wedge-shaped white marks before subterminal line above and below vein 4.. *nocturna*
  b. Forewing without small wedge-shaped white marks before subterminal line.
    a[1]. Forewing with pale streaks on veins 6 and 4 intersecting the dark postmedial patch .. *harmonica.*
    b[1]. Forewing without pale streaks on veins 6 and 4 intersecting the dark postmedial patch .. *thuaitesi.*

B. Forewing without terminal lunule at discal fold.
  a. Forewing whitish suffused with grey-brown .. *transversa.*
  b. Forewing with the ground colour bright rufous .. *rufescens.*

1838*a*. IAMBIA NOCTURNA.
1839*c*. IAMBIA HARMONICA.
1866. IAMBIA THUAITESI.
1867. IAMBIA TRANSVERSA.
1870. IAMBIA RUFESCENS.

Genus IAMBIODES.

Type.

Iambiodes, Hmpsn. Cat. Lép. Phal. B. M. vii., p. 659 (1908). *anormalis.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and rather broadly scaled, the 3rd moderate; frons with large prominence with raised corneous walls at extremity; eyes large, round; antennæ of female somewhat laminate; thorax clothed almost entirely with scales, the prothorax without crest, the mesothorax with small paired crests, the metathorax with decumbent crest; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

3·4 from angle of cell; 5 obsolescent from middle of discocellulars: 6·7 from upper angle; 8 anastomosing with the cell near base only.

2025*a*. IAMBIODES ANORMALIS.

Genus PARIAMBIA.

Type.

Pariambia, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 660, (1908).. *pulla*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about vertex of head and moderately scaled, the 3rd moderate; frons with rounded prominence with vertical corneous ridge down middle; eyes large round: antennæ of male minutely ciliated; thorax clothed almost entirely with scales and without crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole: 11 from cell. Hindwing with veins 3·4 from angle of cell; 5. obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Metathorax without white patch; forewing reddish brown suffused with fuscous .. .. .. *pulla*.

B. Metathorax with white patch; forewing grey suffused with fuscous .. .. *unduligera*.

2089. PARIAMBIA PULLA.

Acontia pulla, Swinh., P. Z. S., 1885, p. 456, pl. 27, f. 15.

Pariambia aprepes, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 660 (1908).

2078. PARIAMBIA UNDULIGERA.

Genus AUCHA.

Type.

Aucha, Wlk., xiii., 1137 (1857) .. .. .. *velans*.

A. Hindwing with orange patch below and beyond end of cell.

a. Forewing with the antemedial, postmedial, and terminal areas strongly suffused with grey .. *nectens*.

b. Forewing uniform dark brown slightly suffused with grey.. .. .. *velans*.

B. Hindwing nearly uniform dark brown .. .. *minor*.

1664. AUCHA NECTENS.

1663. AUCHA VELANS.

1663*a*. AUCHA MINOR.

Aucha minor, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 666, pl. 123 f. 11 1908).

♀. Head and thorax dark brown tinged with grey; pectus and legs greyer, the tarsi slightly ringed with white; abdomen grey-brown with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a reddish tinge. Forewing dark chocolate-brown largely suffused with grey; traces of a double curved sinuous antemedial line with an oblique dark brown shade beyond it from costa to median nervure: orbicular and reniform absent; an indistinct medial line, oblique from cell to inner margin; postmedial line indistinct, brown, dentate, oblique from costa to vein 6, slightly angled inwards at discal fold, incurved below vein 4, a triangular red-brown patch beyond it on costal area with some grey points on the costa; an indistinct waved brown subterminal line; a terminal series of slight brown spots. Hindwing red-brown with the terminal area dark brown; cilia pale rufous with a red-brown line near base; the underside greyish suffused with rufous except on inner area to the indistinct curved postmedial line, a slight discoidal lunule.

Habitat.—BOMBAY, KARWAR, *Exp.* 26 mill.

Genus POLYPHÆNIS.

	Type.
Polyphænis, Boisd., Ind. Meth., p. 128 (1840).	*sericata.*
Triphænopsis, Butl. A. M. N. H. (5) i., p. 163 (1878) ..	*lucilla.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair in front, the 3rd typically moderate; frons smooth; eyes large, round; antenna of male typically bipectinate with short branches; the apical part serrate; thorax clothed almost entirely with scales, the prothorax with spreading crest, the metathorax with divided crest; abdomen with dorsal series of crests. Forewing with the apex rounded, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. iv. (*Triphænopsis*). Antennæ of male ciliated.

A. Palpi with the 3rd joint very long and porrect.

1749. POLYPHÆNIS PULCHERRIMA.

Epilecta pulcherrima, Moore, P. Z. S., 1867, p. 54, pl. 6, f. 3.
Polyphænis largetani, Obuth. Et. Ent. vi., p. 19, pl. viii, f. 4 (1881).
Epilecta opulenta, Butl. P. Z. S., 1883, p. 160.

B. Palpi with the 3rd joint short.

a. Hindwing with the inner edge of the terminal band strongly incurved at discal fold .. .. .. *confecta.*

b. Hindwing with the inner edge of the terminal band not incurved at discal fold

a^1. Hindwing with the inner area brown,

a^2. Hindwing with dark discoidal striga, the postmedial line absent .. ..*diminuta.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

b1. Hindwing without discoidal striga, a slight postmedial line from vein 6 to inner margin. *inepta.*

b. Hindwing with the inner area not brown .. *indica.*

1748. POLYPHÆNIS CONFECTA.

1746. POLYPHÆNIS DIMINUTA.

1745. POLYPHÆNIS INEPTA.

1747. POLYPHÆNIS INDICA.

Genus ARÆA.

Type.

Aræa, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 688 (1908) .. *attenuata.*

Proboscis fully developed; palpi upturned, slender, the 2nd joint reaching about to vertex of head and moderately fringed with hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male minutely ciliated; build slender; head and thorax roughly clothed with hair and scales mixed, the pro- and metathorax with loose spreading crests; tibiæ fringed with rather long hair; abdomen with some rough hair at base, but without crests, the female with long exserted ovipositor. Forewing narrow and elongate, the apex rounded, the termen obliquely curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 stalked; 8 anastomosing with the cell near base only.

1971. b. ARÆA ATTENUATA, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 688 (1908).

Head and thorax grey mixed with dark brown; palpi black except in front; frons with lateral black bars; tarsi black with pale rings; abdomen brownish grey. Forewing brown tinged with grey and irrorated with black; subbasal line black, somewhat dentate, from costa to submedian fold; a black streak below the cell confluent with the lower edge of claviform, which is narrow and acuminate; antemedial line strong, black, slightly angled outwards below costa, then minutely waved; orbicular and reniform grey irrorated with brown and strongly defined by black, the former round or oblique elliptical, open above; the discal and postmedial areas more strongly suffused with brown; postmedial line strong, black, defined on outer side by whitish, but outwards below costa, then dentate, strongly excurved to vein 4, then very oblique, some white points beyond it on costa; subterminal line diffused, white, angled outwards at vein 7 and inwards at discal and submedian folds, at former to postmedial line, with short black streak beyond it above and below vein 5; a terminal series of small black lunules; cilia white with brownish line through them. Hindwing whitish suffused with brown; a slight brown terminal line; cilia

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

white with a brownish line through them except towards tornus; the underside white irrorated with brown, a blackish discoidal spot and indistinct curved postmedial line.

Habitat.—KASHMIR, Scinde Valley, Goorais Valley. *Exp.* 34 mill.

Genus CANNA.

Type.

Canna, Wlk., xxxiii. 790. (1865) .. .. *pulchripicta.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair, the 3rd short; frons smooth; eyes large, round; antennæ of male laminate; thorax clothed with elongate scales, the prothorax without crest; the mesothorax with paired tufts of scales, the metathorax with spreading crest; the patagia with upturned tufts of scales at extremity; tibiæ fringed with long hair; abdomen with dorsal series of crests, the crest on 4th segment large. Forewing short and broad, the apex rounded, the termen excurved at middle and excised below apex and towards tornus which is somewhat lobed; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Abdomen with the crest on 4th segment formed of long black scales.

a. Forewing with the medial band green tinged with fuscous .. .. *prasinaria.*

b. Forewing with the medial band red-brown .. .. *malachitis.*

B. Abdomen with the crest on 4th segment formed of ochreous hair .. .. *pulchripicta.*

1965. CANNA PRASINARIA.

1964. CANNA MALACHITIS.

1963. CANNA PULCHRIPICTA.

Genus DASEOCHÆTA.

Type.

Daseochæta, Warren, Seitz., Macrolepidoptera, pt. 9, p. 11 (1907) .. .. *viridis.*

Diphtherocome, Warren, Seitz, Macrolepidoptera, pt. 9, p. 11 (1907) .. .. *pallida.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and fringed with hair in front, the 3rd rather long, naked; frons smooth; eyes large, round; antennæ of male typically bipectinate with long branches to apex; thorax clothed with long rough hair and hair-like scales, the pro- and metathorax with spreading crests, the patagia

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tufted at extremity; tibiæ fringed with hair; abdomen with dorsal series of crests, large at middle. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. II. (*Diphtherocome*). Antennæ of male bipectinate with moderate branches, the apical fourth ciliated.

1967. DASEOCHÆTA PALLIDA.

Sect. III. Antennæ of male bipectinate with short branches, the apical third ciliated.

A. Hindwing with broad brownish subterminal band .. *vigens.*

B. Hindwing without subterminal band.

a. Forewing with large quadrate black mark in outmedian interspace before postmedial line .. *brevipennis.*

b. Forewing with slight black spot in submedian interspace before postmedial line .. .. *fasciata.*

1966. DASEOCHÆTA VIGENS.

1967*a*. DASCOCHÆTA BREVIPENNIS.

Daseochæta brevipennis, Hmpsn., Cat. Lep. Phal. B. M. viii., p. 27, pl. 123, f. 21 (1909).

Head and thorax pale blue-green; palpi black; antennæ brown; shoulders with black patches; tibiæ with black spots, the tarsi banded black and white; abdomen ochreous white dorsally suffused with ochreous brown, ventrally black-brown. Forewing pale blue-green, the basal and postmedial areas suffused with olive-green; subbasal line represented by a black striga from costa; a short black streak in base of sub-median fold, and a curved black streak above inner margin from near base to the antemedial line, which is black defined on outer side by white, incurved in cell, angled outwards in submedian fold, then incurved and ending at the streak above inner margin; claviform minute, defined by some black scales above and at extremity; orbicular and reniform defined by black and white at sides and with quadrate black patch between them, the former small, round, sometimes defined by black below; a black bar from middle of costa and oblique striga from inner margin; the medial area with white fascia in submedian fold ending in a quadrate black spot before postmedial line with spurs above and below from its inner edge; postmedial line black defined by white on inner side, bent outwards below costa, incurved at discal fold, excurved and slightly angled at veins 4·3, then strongly incurved to submedian fold, and excurved to inner margin, some black points beyond it on costa, followed by a triangular spot; a series of black points formed by diffused scales towards

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

termen; cilia with series of black lunules at tips. Hindwing white faintly tinged with green; a diffused blackish discoidal spot, with diffused band, from it to inner margin, and traces of a postmedial line at middle and towards tornus; the underside with slight black streak in middle of cell diffused curved medial band blacker towards costa and more or less confluent with the discoidal spot, much interrupted postmedial line, and series of black points before termen.

Habitat.—SIKHIM; TIBET. Yatong. *Exp.* 32 mill.

1967*b*. DASEOCHÆTA FASCIATA.

Diphthera fasciata, Moore, P. Z. S., 1888, p. 408, Butl. Ill. Het. B. M. vii., p. 30, pl. 122, f. 1.

Palpi black, white at tips; head brownish white, the vertex green, the sides of frons black, the antennæ brown, white at base; tegulæ and patagia blue-green, the dorsum of thorax brownish white; pectus green at sides, black-brown ventrally; tibiæ green with black marks, the tarsi banded black-brown and white; abdomen brownish white with a large black-brown ventral patch. Forewing pale blue-green with some darker suffusion before the antemedial line and beyond the postmedial line; subbasal line represented by a black joint on costa followed by a bar; a very short black streak below base of cell and an oblique white fascia above a curved black fascia on inner area extending to the antemedial line, which is represented by an oblique striga from costa and a line slightly defined on outer side by white from subcostal nervure to the black fascia above inner margin, bent outwards at median nervure, angled outwards at submedian fold, then incurved; the medial area with white streak in submedian fold with black point on it at extremity of claviform; orbicular and reniform defined by black and white at sides with quadrate black patch between them, open above and below, the former round, a black bar from costa to the black patch, a point on inner margin and a small black lunule in submedian fold on inner edge of the postmedial line, which is represented by two black points on costa and black line defined on inner side by white from below costa, much nearer termen, angled inwards at discal fold, outwards at veins 4·3, then bent inwards and outwardly oblique to inner margin, a black spot with white point on it beyond it on costa; cilia with slight black-brown lunules at tips. Hindwing pale blue-green with some ochreous hair on inner area; a diffused blackish discoidal spot; the underside with strong black bar from costa to the discoidal spot and two spots on inner area, postmedial points below costa and vein 7 and small spots in discal and submedian folds and above inner margin.

Habitat.—W. CHINA; PUNJAB, Laka; SIKHIM. *Exp.* 44 mill.

Sect. IV. Antennæ of male serrate and fasciculate.

1968*a*. DASCOCHÆTA CHRYSOCHLORA.

Sect. V. Antennæ of male ciliated.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A. Forewing with black postmedial band interrupted by white streaks on veins 6, 4, 3, 2. .. ... *muscosa.*

B. Forewing with the postmedial band not interrupted by white streaks .. .. *discibrunnea.*

1977. DASCOCHÆTA MUSCOSA.

Bryophila muscosa, Hmpsn. Ill. Het. B. M. viii., p. 72, pl. 144, f. 15 (1891).

Diphthera imray, Hmpsn. J. Bomb. Nat. Hist. Soc. xvii., p. 472 (1906).

1968. DASEOCHÆTA DISCIBRUNNEA.

Genus THALATHA.

Type.

Thalatha, Wlk., Journ. Linn. Soc. Zool. vi., p. 187 (1862) *sinens.*

Proboscis fully developed ; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair in front, the 3rd moderate ; frons with very small corneous prominence at middle with raised edges; eyes large, round ; antennæ of male typically laminate ; thorax clothed chiefly with scales and without crests ; tibiæ moderately fringed with hair ; abdomen with dorsal crests at base only. Forewing with the apex typically rounded, the termen evenly curved and very slightly crenulate ; veins 3 and 5 from near angle of cell ; 6 from upper angle ; 9 from 10 anastomosing with 8 to form the areole ; 11 from cell. Hindwing with veins 3·4 from angle of cell ; 5 obsolescent from middle of discocellulars ; 6·7 shortly stalked or from angle ; 8 anastomosing with the cell near base only.

A. Forewing with terminal series of small black spots.. *conjecturalis.*

B. Forewing with terminal series of slight dark striæ.. *sinens.*

1817. THALATHA CONJECTURALIS.

Thalatha sinens, Wlk., Journ. Linn. Soc. Zool. vi., p. 187 (1862) var. nec. 1856.

Bryophila conjecturalis, Swinh. Trans. Ent. Soc. 1890, p. 222, pl. vii., f. 10.

1816. THALATHA SINENS.

Genus GOENYCTA.

Type.

Goenycta, Hmpsn., Cat. Lep. Phal. B. M. viii., p. 49 (1909). *niveiguttata.*

Probocis fully developed ; palpi upturned, the 2nd joint reaching to middle of frons and moderately fringed with hair in front, the 3rd short ; frons with rounded prominence with corneous plate below it ; eyes large, round ; antennæ of female ciliated ; thorax smoothly clothed with scales only and without crests ; tibiæ moderately fringed with hair ; abdomen with dorsal series of crests, the crest on segments 3·4·5 large. Forewing rather narrow, the margins subparallel, the apex rounded, the termen slightly excurved at middle and not crenulate ; veins 3 and 5 from near

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars, 6·7 from upper angle; 8 anastomosing with the cell near base only.

1993*a*. GOENYCTA NIVEIGUTTATA.

Genus TYCRACONA.

	Type.
Tycracona, Moore, Lep. Atk. p. 95 (1882)	*obliqua.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately scaled, the 3rd porrect, short; frons with small rounded prominence at middle; eyes large, round; antennæ laminate; thorax clothed almost entirely with scales and without crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing triangular, the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with the termen strongly curved; veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1823. TYCRACONA OBLIQUA.

Genus CRANIOPHORA.

	Type.
Craniophora, Snell. Vlind. van. Ned. ii. p. 262 (1872) ..	*ligustri.*
Bisulcia. Chapman, Ent. Rec. i. p. 28 (1890)	*ligustri.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair in front, the 3rd short; frons smooth; eyes large, round; antennæ simple and laminate in both sexes; thorax clothed with scales mixed with hair; the prothorax without crest, the metathorax with divided crest; tibiæ moderately fringed with hair; abdomen with dorsal series of crests and rough hair at base. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with prominent black fascia in submedian fold extending to termen.

a. Forewing with the claviform large, defined by black. *nigrivitta.*

b. Forewing with the claviform absent .. .. .. *fasciata.*

B. Forewing without prominent black fascia in submedian fold .. .. *nubilata.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1820. CRANIOPHORA NIGRIVITTA.

1822. CRANIOPHORA FASCIATA.

Acronycta fasciata, Moore, Lep. Ceyl. iii., p. 5, pl. 144, f. 4 (1884).

Hyboma divisa, Moore, P. Z. S. 1888, p. 409; Butl. Ill. Het. B. M. vii., p. 45, pl. 125, f. 7.

Acronycta nigrostriata, Pag. Jahrb. Nass. Ver. xli., p. 128 (1889).

1711. CRANIOPHORA NUBILATA.

Genus ACRONYCTA.

	Type.
Acronicta, Ochs. Schmett. Eur. iv., p. 62 (1815). non deser.	*leporina.*
Acronycta, Treit. Schmett. Eur. v. (1). p. 3. (1825)	*leporina.*
Hyboma, Hübn. Verz., p. 200 (1827)	*strigosa.*
Triœna, Hübn. Verz. p. 200 (1827)	*psi.*
Jocheœra, Hübn. Verz., p. 201 (1827)	*alni.*
Pharetra, Hübn. Verz. p. 202 (1827)	*auricoma.*
Arctomyscis, Hübn. Verz. p. 202 (1827)	*aceris.*
Microœlia, Guen. Noct. i., p. 33 (1852)	*fragilis.*
Megacronycta, Grote, Bull. Buff. Soc., Nat. Sci. i. p. 79 (1873)	*hastulifera.*
Lepitoreuma, Grote, Bull. Buff. Soc. Nat. Sci. i, p. 80 (1873)	*ovata.*
Plataplecta, Butl. A. M. N. H. (5) i., p. 195 (1878)	*pruinosa.*
Mastiphanes, Grote, New Check List, p. 23 (1882) non. deser.	*edolata.*
Viminia, Chapman, Ent. Rec. i., p. 26 (1890)	*rumicis.*
Cuspidia, Chapman, Ent. Rec. i, p. 27 (1890)	*psi.*
Pseudopunda, Butl. Trans. Ent. Soc. (1890) p. 672	*bicolor.*
Tricholonche, Grote, Mitth. Hildersheim, iii, p. 16 (1896) ..	*afflicta.*
Philorgyia, Grote, Mitth. Hildersheim Mus. iii. p. 17 (1896)...	*luteicoma.*
Apatela, Hübn. Tent. ined	*aceris.*

Sect. I. (*Hyboma*).—Thorax clothed chiefly with scales.

A. Forewing with distinct black streak from postmedial line to termen in submedian fold .. *albiorbis.*

B. Forewing without distinct black streak from postmedial line to termen in submedian fold.

a. Forewing without prominent white spot on postmedial line in submedian fold .. .. .. *pruinosa.*

b. Forewing with prominent white spot on postmedial line in submedian fold .. .. *rumicis.*

1818 *b*. ACRONYCTA ALBIORBIS.

Plataplecta pruinosa, Moore, Lep. Ceyl. iii, p. 5, pl. 144, f. 3 (nec. Guen).

Acronycta albiorbis, Hmpsn., Cat. Lep. Phal. B. M. viii, p. 74 (1909).

Head and thorax white mixed with reddish brown; palpi with blackish mark on 2nd joint above; tegulæ and patagia edged with blackish; abdomen whitish suffused with pale yellow-brown. Forewing white almost entirely suffused with pale rufous; subbasal line represented by a black

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

striga from costa; a rather diffused sinuous black streak in submedian fold from base to the antemedial line which is double, the lines widely separated towards costa, oblique, waved, with black point on the outer line at submedian fold with white streak from it to the medial line; orbicular rather quadrate, extending to the antemedial line and defined on outer side by an oblique black striga; reniform large, rather quadrate, incompletely defined by black except above and with slight dark lunule on inner side of centre; a slight dark patch at middle of costa and brownish line from cell to inner margin angled outwards at vein 1; postmedial line double filled in with whitish lunules, bent outwards below costa, then minutely dentate, excurved to vein 4, then incurved, crossed by a black streak in submedian fold from medial to subterminal lines, some brown suffusion beyond it in discal and submedian folds; subterminal line found by ill-defined white lunules; some slight black striæ on termen defined by whitish lunules. Hindwing whitish suffused with pale red-brown; an indistinct postmedial line defined on outer side by whitish; the underside white tinged with red-brown, the costal and terminal areas slightly irrorated with brown, a brownish patch on middle of costa, slight discoidal spot and diffused postmedial line, oblique and waved to vein 5, then incurved.

ab. 1. Greyer and irrorated with dark-brown; forewing with the white lunules on postmedial line smaller and less distinct. Travancore.

Habitat.—TRAVANCORE, Pirmád; CEYLON, Pundaluoya. *Exp.* ♂ 38; ♀ 42 mill.

1818. ACRONYCTA PRUINOSA.

Acronycta pruinosa, Guen. Noct. 1, p. 53 (1852); Hmpsn., Cat. Lep. Phal. B. M. viii, p. 91, pl. 125, f. 10.

Polia soluta, Wlk., xxxiii. 723 (1865).

1696. ACRONYCTA RUMICIS.

Noctua rumicis, Linn. Syst. Nat. ed. x., p. 516 (1758); Esp. Schmett. iv, pl. 17, ff. 7-9; Hübn. Eur. Schmett. Noct., f. 9 Frr. Neue Beit., pl. 543; Steph. Ill. Brit. Ent. Haust., iii p. 42; Dup. Lep. Fr. vi, p. 241, pl. 88, f. 2; Staud. Cat. Lep. Pal., p. 133.

Acronycta salicis, Curt. Brit. Ent., v. pl. 136 (1829).

„ *diffusa*, Wlk. xi, 708 (1857).

„ *indica*, Moore, P. Z. S. 1867, p. 1 47.

„ *turanica*, Staud., Stett Ent. Zeit., 1888, p. 65; id. Rom. Mém. v., pl. 8, f. 5.

„ *alnoides*, Grest, Allg. Zeit. Ent., viii, p. 310 (1903).

Sect. II. (*Triæna*).—Thorax clothed with hair like scales mixed with a few scales.

A. Forewing with the orbicular and reniform conjoined by a black streak.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a. Forewing with black streak in discal fold beyond postmedial line .. .. *maxima.*

b. Forewing without black steak in discal fold beyond postmedial line.

a[1]. Forewing without black shade in submedian interspace from base to termen .. .. *iria.*

b[1]. Forewing with black shade in submedian interspace from base to termen .. .. .. *rubiginosa.*

B. Forewing without black streak between orbicular and reniform.

a. Forewing with distinct black streak below base of cell .. .. *gastridia.*

b. Forewing without black streak below base of cell.. *bicolor.*

1813. ACRONYCTA MAXIMA.

Acronycta maxima, Moore, P. Z. S. 1881, p. 333 ; Hmpsn., Cat. Lep. Phal. B. M., viii., p. 112, pl. 125, f. 21.

1813*a*. ACRONYCTA IRIA.

Acronycta iria, Swinh., A. M. N. H. (7) iii, p. 113 (1899) ; Hmpsn., Cat. Lep. Phal. B. M. viii, p. 113, pl. 125, f. 22.

♂. Head and thorax grey suffused with pale red-brown ; palpi white, the 2nd joint with black band ; antennæ with the basal joint black behind at tip ; shoulders with black streak ; tibiæ streaked with black ; abdomen whitish dorsally tinged with brown. Forewing whitish suffused and irrorated with pale red-brown : subbasal line represented by double oblique dark striæ from costa ; a sinuous black streak in submedian fold from base to antemedial line where it forks, giving off a slight spur below at middle ; antemedial line indistinct, double, the lines very widely separated on costal half; oblique, waved, angled inwards on vein 1 and excurved above inner margin, the outer line angled outwards below costa ; orbicular and reniform defined by fuscous, the former whitish with slight rufous centre, rather oblique elliptical, with a black streak from it extending into the reniform which has a rufous centre ; a diffused oblique fuscous line from costa to reniform and traces of an oblique sinuous line from lower angle of cell to inner margin at antemedial line ; postmedial line double, black filled in with white, the inner line incomplete, bent outwards below costa, then dentate, strongly incurved below vein 4, crossed by a black streak in submedian fold from well before it to termen towards which it expands, some whitish points beyond it on costa ; the veins of terminal area with slight dark streak ; faint traces of a minutely waved whitish subterminal line with slight dark streaks in the interspaces from it to the series of small black spots on termen and base of cilia, which are white with a slight black line through them. Hindwing white, the veins tinged with brown, the terminal area slightly suffused with brown from apex to submedian fold

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and with a terminal series of slight dark lunules; the underside with the costal area slightly irrorated with brown, a black discoidal spot, faint traces of postmedial line with blackish spot in submedian fold and terminal series of slight dark lunules.

♀. Hindwing with indistinct sinuous postmedial line and the terminal area more suffused with fuscous.

Habitat.—PUNJAB, Kulu, Sultanpur. *Exp.* 50-54 mill.

1819. ACRONYCTA RUBIGINOSA.

Acronycta rubiginosa, Wlk., Journ. Linn. Soc. Zool. vi., p. 178, (1862).
Triæna denticulata, Moore, P. Z. S., 1888, p. 408; Butl., Ill. Het. B. M. vii., p. 45, pl. 125, f. 8.

1815. ACRONYCTA GASTRIDIA.

Acronycta aceris, Hmpsn., Moths. Ind. ii, p. 241 (nec. Linn.)
" *gastridia*, Swinh., A. M. N. H. (6) xv, p. 5 (1895).

1821. ACRONYCTA BICOLOR.

Genus SIMYRA.

Type.

Simyra, Ochs. Schmett. Eur. iv., p. 18 (1816), non. descr.; Treit. Schmett. Eur. (5) ii, p. 280 (1825) .. *albovenosa.*
Arsilonche, Led. Noct. Eur., p. 70 (1857).. .. .. *albovenosa.*

Proboscis aborted, minute; palpi porrect, extending to beyond the frons and clothed with long hair; frons smooth; eyes rather small, round; antennæ of male typically laminate; thorax clothed with hair only and without crests; tibiæ fringed with long hair; abdomen dorsally clothed with rough hair at base and with lateral fringes of hair, but without crests. Forewing with the apex somewhat produced and acute, the termen obliquely curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell or shortly stalked; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing nearly uniform rufous, the costal edge white . *albicosta.*
B. Forewing with the costal edge not white.
a. Forewing pale rufous thickly irrorated with rufous .. *confusa.*
b. Forewing ochreous white sparsely irrorated with rufous .. .. *conspersa.*

1944*a*. SIMYRA ALBICOSTA.

Simyra albicosta, Hmpsn., Cat. Lep. Phal. B. M. viii, p. 178, pl. 127, f. 15 (1909).

♀. Head and thorax white, the head, tegulæ, prothorax, front of pectus and legs suffused with rufous; abdomen white tinged with red-brown. Forewing rufous, the costal edge white, the median nervure and veins of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

terminal half slightly streaked with white; a white spot at base of costa; cilia tipped with white. Hindwing white faintly tinged with red-brown; cilia white.

Habitat—MADRAS, Nilgiris. *Exp.* 40 mill.

1944. SIMYRA CONFUSA.

1949. SIMYRA CONSPERSA.

Genus CETOLA.

	Type.
Cetola, Wlk. v., 1015 (1855)	*dentata.*
A. Forewing with crimson suffusion on costal area to beyond middle	*rubricosta.*
B. Forewing with fuscous suffusion on costal area to beyond middle	*dentata.*

2348*a*. CETOLA RUBRICOSTA.

2348. CETOLA DENTATA.

Genus MATOPO.

	Type.
Matopo, Dist. A. M. N. H. (7) i, p, 227 (1898)	*typica.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short, porrect; frons with large rounded prominence with corneous plate below it; eyes large, round; antennæ of male typically bipectinate with rather long branches, the apex simple; thorax clothed chiefly with scales, the pro-and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. II..—Antennæ of male minutely serrate, of female ciliated.

2672. MATOPO CELECTA.

Xylophasia selecta, Wlk, xxxii, 646 (1865).

Calophasia lobifera, Moore, P. Z. S. 1881, p. 358.

Genus DELTA.

	Type.
Delta, Saalm, Lep. Madag., p. 263 (1891)	*stolifera.*
Trichorhiza, Hmpsn., Cat. Lep. Phal. B. M. v., p. 13 (1905).	*peterseni.*

Proboscis fully developed; palpi obliquely porrect, reaching to just beyond frons, the 2nd joint rather broadly fringed with hair below, the 3rd short; frons smooth, with ridges of hair at middle and above; eyes large, round; antennæ of male ciliated; thorax clothed with hair and scales mixed, the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tegulæ produced to a dorsal ridge above the thorax with divided ridge-like crest; tibiæ fringed with long hair on outer side; abdomen with dorsal crests on basal segments. Forewing with the apex somewhat produced and acute, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the reniform expanding below and extending to well below angle of cell .. .. *intermedia.*

B. Forewing with the reniform small and not extending to below the cell .. .. *indica.*

1941. DELTA INTERMEDIA.

1803. DELTA INDICA.

Genus CHIRIPHA.

Type.

Chiripha, Wlk, ix, 200 (1859) .. .. .. *involuta.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair, the 3rd short; frons smooth, with ridge of hair above; eyes large, round; antennæ of male bipectinate with short branches, the apex serrate; head and thorax clothed with hair and hairlike scales, the pro-and metathorax with spreading crest; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex somewhat produced and acute, the termen obliquely curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1784. CHIRIPHA INVOLUTA.

Genus CALOGRAMMA.

Type.

Calogramma, Guen. Noct. i., p. 165 (1852) .. .. *festiva.*

1832. CALOGRAMMA FESTIVA.

Genus PRODENIA.

Type.

Prodenia, Guen. Noct. i., p. 159 (1815) .. .. .. *androgea.*

1829. PRODENIA LITURA.

Noctua litura, Fabr. Syst. Ent., p. 601 (1775).

„ *histrionica*, Fabr. Syst. Ent., p. 612 (1775).

„ *elata*, Fabr. Spec. Ins., ii, p. 220 (1781).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Hadena littoralis, Boisd. Faun. Ent., Mad, p. 91, pl. 13, f., 8 (1833). Moore, Lep. Ceyl. iii., p. 19, pl. 146, ff. i, a. b.; Staud Cat. Lep. pal., p. 184.

„ *retina*, Frr. Neue, Beitr. v., p. 161, pl. 478, ff. 2·3 (1846); Herr. Schaff. Eur. Schmett. Noct., ff. 144-5.

Prodenia tasmanica, Guen. Noct. i., p. 163 (1852).

„ *ciligera*, Guen. Noct. i., p. 164 (1852).

„ *testaceoides*, Guen. Noct. i, p. 165 (1852).

„ *subterminalis*, Wlk., ix, 196 (1856).

„ *glaucistriga*, Wlk., ix, 197 (1856).

„ *declinata*, Wlk., xi, 723 (1857).

Mamestra albisparsa, Wlk., Journ, Linn. Soc. Zool. vi, p. 186 (1862).

Prodenia evanesceous, Butl., Mem. Nat. Ac. Sci. Wash. Rep. Eclipse. Exp., p. 94 (1884).

Genus SPODOPOTERA. *Type.*

Spodoptera, Guen. Noct. i, p. 153 (1852) .. .. .. *mauritia.*

Eulaphygma, Butl. Trans. Ent. Soc. 1890, p. 668 .. .. *abyssinia.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with scales, the prothorax without distinct crest, the metathorax with spreading crest; fore tibiæ broadly fringed with hair on outer side, the mid and hind tibiæ moderately fringed; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with short branches, the apex serrate.

1874. SPODOPTERA PECTEN.

Spodoptera pecten, Guen. Noct. i., p. 155 (1852); Staud. Cat. Lep. pal. p. 195 (part).

„ *erica*, Butl. P. Z. S., 1880, p. 675.

Spœlotis uniformis, Swinh., Trans. Ent. Soc. 1890, p. 226.

Caradrina pectinata, Hmpsn., Moths Ind. ii, p. 264 (1894).

Sect. II. (*Eulaphygma*).—Antennæ of male minutely serrate and fasciculate.

1831*a*. SPODOPTERA ABYSSINIA.

Spodoptera abyssinia, Guen. Noct. 1, p. 154 (1852).

„ *cilium*, Guen. Noct. 1, p. 156 (1852).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Caradrina latebrosa, Led. Verz. Zool. Bot. Ges. Wien. 1855, p. 205. pl. 2. f., 11; Staud. Cat. Lep. pal. p. 195.
,, *orbicularis*, Wlk., x., 294 (1856); Hmpsn. Nat. Hist. Sokotra, p. 323, pl. xx, f. 26.
,, *præterita*, Wlk., x., 294 (1856).
,, *insignata*, Wlk., x., 295 (1856).
Laphygma procedens, Wlk., xi., 721 (1857).
Agrotis infixa, Wlk. Journ. Linn. Soc. Zool. vi., p. 186 (1862).
Laphygma obliterans, Wlk., Trans. Ent. Soc. (3) 1, p. 87 (1862).
Spodoptera insulsa, Wlk., xxxii., 648 (1865).
Laphygma imperviata, Wlk., xxxii., 651 (1865).
,, *retrahens*, Wlk., Entom. v., p. 126 (1870).

♂. Head and thorax ochreous suffused with red-brown; palpi with black bands on 2nd and 3rd joints near extremities; frons with lateral black bars; tegulæ with black medial line; tarsi black ringed with white; abdomen whitish dorsally suffused with brown. Forewing greyish suffused with brown; subbasal line represented by double black striæ from costa and cell; antemedial line double filled in with whitish, the inner line indistinct, oblique, waved; orbicular whitish defined by black and with slight brown centre, oblique elliptical, open below and connected by a streak above median nervure with the reniform which is defined by black on inner side, its centre defined by diffused black; an oblique dark striga from costa to reniform and waved line from lower angle of cell to inner margin, angled inwards in submedian fold; postmedial line double filled in with whitish, the outer line indistinct, bent outward below costa, then minutely dentate, incurved below vein 4, some pale points with fuscous between them beyond it on costa; subterminal line whitish defined on inner side by fuscous suffussion except between veins 7 and 5, and with slight dark streaks in the interspaces before it at middle, angled outward at vein 7, recurved and slightly waved at middle and angled inwards in sub-median fold; the terminal area tinged with fuscous; a terminal series of small rather triangular black spots; cilia whitish with a fuscous line near base and some fuscous at tips. Hindwing from semihyaline white; the underside with the costa slightly irrorated with brown, a terminal veins of black points from apex to vein 2.

♀. Forewing with the orbicular completely defined by black, the reniform with fuscous centre and whitish annulus defined by black points on outer side; hindwing with dark terminal line from apex to submedian fold and dark line through the cilia to vein 2.

Habitat.—Sierra Leone; Lagos; Nigeria; Egypt; Arabia; Abyssinia; Sokotra; Br. E. Africa; Mashonaland; Natal; Cape Colony; Mauritius; Rodriguez; Seychelles; Asia Minor; Syria; Palestine

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PERSIA; PUNJAB, Sultanpur; SIKHIM; BOMBAY, Bandra; MADRAS; Gooty; PHILIPPINES; BORNEO; JAVA. *Exp.* 28-32 mill.

Larva.—Ochreous with numerous pale points defined by pale brown; dorsal line orange; subdorsal line represented by a series of orange marks defined by irregular black lunules above; lateral line represented by orange marks, the stigmata black with brown patches above them; head and thoracic plate red-brown.

Sect. III. (*Spodoptera*).—Antennæ of male ciliated; fore tibiæ with very large tufts of hair and scales from outer side.

A. Hindwing semihyaline white .. .. *mauritia.*

B. Hindwing cupreous brown .. .. .. *postfusca.*

1831. SPODOPTERA MAURITIA insert (syn.)

Spodoptera acronyctoides. Guen. Noct. i., p. 154 (1852).

1868. SPODOPTERA POSTFUSCA.

Genus LAPHYGMA.

Type.

Laphygma, Guen. Noct. i, p. 156 (1852) .. .. .. *exigua.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male minutely serrate or ciliated; thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with spreading crest; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rectangular, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male minutely serrate.

1829*a*. LAPHYGMA APERTURA.

Prodenia apertura, Wlk., xxxii, 654 (1865).

„ *synstictis,* Hmpsn., Moths Ind. iv, p. 511 (1896).

Sect. II.—Antennæ of male ciliated.

A. Forewing with the orbicular narrow, oblique elliptical .. .. *exempta.*

B. Forewing with the orbiculen round or slightly elliptical .. .. *exigua.*

1855*a*. LAPHYGMA EXEMPTA.

Agrotis exempta, Wlk., 355 (1856); Hmpsn., Cat. Lep. Phal. B. M. viii. p. 261, pl. 128, f. 24.

Prodenia bipars, Wlk., xi., 724 (1857).

„ *ingloria,* Wlk. xv., 1679 (1858).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♂. Head and thorax grey tinged with red-brown, the head and basal half of tegulæ browner; palpi with slight dark marks at sides of 2nd joint, tarsi brown ringed with white; abdomen ochreous tinged with brown. Forewing grey tinged with brown and suffused in parts with purplish red especially on costal half from medial to subterminal line; subbasal line represented by indistinct double dark striæ from costa and cell; an oblique black striga with some purplish red beyond it across submedian interspace before the antemedial line, which is double, rather oblique, waved, excurved in submedian interspace; claviform purplish red rather incompletely defined by black; orbicular grey tinged with olive brown and slightly defined by black, oblique elliptical and with pale bar beyond it; reniform slightly and incompletely defined by black and with a diffused blackish mark in centre; the median nervure and veins arising from it slightly streaked with white on medial area; traces of an oblique waved medial line from lower angle of cell to inner margin; postmedial line double, the outer line indistinct, bent outward below costa, then minutely waved, angled inwards in discal fold and incurved below vein 4, some pale points beyond it on costa; a diffused oblique whitish shade from apex to vein 6, the subterminal line arising from it, whitish, minutely waved, incurved below vein 3, with some wedge-shaped black streaks before it at middle, above and below vein 4 extending to postmedial line; a terminal series of slight black lunules; cilia greyish tinged with rufous and with slight rufous line near base. Hindwing ochreous white, the veins tinged with brown, the costal area and termen suffused with brown; a fine dark terminal line; cilia white; the underside with the costal area slightly irrorated with white, a terminal series of blackish points from apex to vein 2.

♀. Forewing more uniform fuscous brown, without the oblique pale bar beyond the orbicular.

Habitat.—Gold Coast; Lagos; Nigeria; Sudan; Br. E. Africa; Mozambique; Rhodesia; Transvaal; Natal; Aden; Madras, Palnis; Ceylon, Maskeliya, Haldamulla; Singapore; Queensland; N. S. Wales; W. Australia; Hawaii. *Exp.* 26-38 mill.

1855. Laphygma exigua.

Noctua exigua, Hubn. Eur. Schmett. Noct. f. 362 (1808); Dup. Lep. Fr. vi., p. 45, pl. 75, f. 2; Mill. Icones, pl. 75, f. 2; Staud. Cat. Lep. pal. p. 195.

„ *fulgens*, Geyer, Eur. Schmett. Noct., f. 796 (1833).

Caradrina pygmæa, Rmbr., Ann. Soc. Ent. Fr. 1834, p. 384, pl. 8, f. 2; Dup. Lep. Fr. Suppl. iii, p. 321, pl. 29, f. 5.

„ *junceti*, Zell. Isis. 1847, p. 455.

Laphygma cycloides, Guen. Noct. i., p. 157 (1852).

„ *caradrinoides*, Wlk., ix., 190 (1856).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Caradrina sebghana, Aust. Le Nat. 1880 p. 212.
,, *venosa*, Butl. Ent. Mo. Mag., xvii., p. 7 (1880).

Genus ANTHA.

	Type.
Antha, Staud. Rom. Mem., vi, p. 448 (1892)	*grata.*
Anodontodes, Hmpsn. Trans. Ent. Soc., 1895, p. 302; id., Moths Ind., iv., p. 523	*rotunda.*
A. Forewing with the orbicular present and with black patch above it on costa..	*grata.*
B. Forewing with the orbicular absent and without black patch at middle of costa	*rotunda.*

1805. ANTHA GRATA.

Leptina grata, Butl. Trans. Ent. Soc. 1881, p. 172; Staud. Cat. Lep. pal., p. 183.

Antha pretiosa, Staud. Rom. Mem., vi, p. 448, pl. 7, f. 6 (1892).

2192*a*. ANTHA ROTUNDA.

Genus AMPHIDRINA.

	Type.
Amphidrina, Staud. Iris., iv, p. 293 (1892)	*agratina.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short, porrect; frons smooth; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with scales, the pro- and meta-thorax with spreading crests; tibiæ moderately fringed with hair; abdomen with some rough hair at base but without crests. Forewing with the apex rounded, the termen evenly curved, crenulate, veins 3 and 5 from near angle; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1864. AMPHIDRINA INTAMINATA.

Genus ATHETIS.

	Type.
Athetis, Hubn. Verz., p. 209 (1827)	*furvula.*
Atypha, Hubn. Verz., p. 213 (1827)	*pulmonaris*
Elaphria, Hubn. Verz., p. 230 (1827)	*morpheus.*
Hapalotis, Hubn. Verz., p. 254 (1827)..	*gutvula.*
Nebrissa, Wlk., Journ. Linn. Soc. Zool., vi., p. 194 (1862)	*bimacula.*
Anorthodes, Smith. Trans. Am. Ent. Soc. xviii., p. 114, (1891)	*tarda.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately fringed with scales in front, the 3rd

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

short; frons smooth; eyes large, round; antennæ of male typically ciliated; thorax clothed with hair and hair-like scales mixed with some scales, the prothorax with small spreading crest, the metathorax without distinct crest; tibiæ moderately fringed with hair; abdomen without crests. Forewing rather narrow, the costa and inner margin subparallel, the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male serrate.

A. Forewing with the reniform present.

a. Forewing with series of dark points beyond postmedial line .. .. *externa.*

b. Forewing without series of dark points beyond postmedial line .. .. *cervina.*

B. Forewing with the reniform absent .. .. *castaneipars.*

1876. ATHETIS EXTERNA.

1802. ATHETIS CERVINA.

1883. ATHETIS CASTANEIPARS.

Sect. II.—Antennæ of male ciliated.

A. Forewing with the reniform with pale annulus.

a. Forewing with the reniform filled in with black.. *delecta.*

b. Forewing with the reniform not filled in with black.

a^1. Forewing with the reniform constricted at middle and angled inwards on median nervure .. .. *prætexta.*

b^1. Forewing with the reniform not constricted at middle or angled inwards on median nervure.

a^2. Hindwing uniform brown .. .. *divisa.*

b^2. Hindwing whitish tinged with brown especially on terminal area .. .. *ambigua.*

B. Forewing with the reniform defined by more or less prominent white points.

a. Hindwing wholly suffused with brown.

a^1. Forewing nearly uniform red-brown.

a^2. Forewing dark red-brown; antennæ of male minutely ciliated .. .. .. *interstincta.*

b^2. Forewing greyer; antennæ of male with long cilia .. .. *longiciliata.*

b^1. Forewing pale rufous or greyish variegated with deep rufous and brown .. .. *fasciata.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

b. Hindwing white, the terminal area suffused with brown.

a^1. Forewing with distinct black spot on costa at medial line.

a^2. Forewing grey faintly tinged with ochreous brown .. .. *bremusa*.

b^2. Forewing much more strongly tinged with ochreous brown .. .. .. *himalayica*.

b^1. Forewing without black spot on costa at medial line.

a^2. Forewing with dentate rufous marks before middle of subterminal line .. .. *fuscicornis*.

b^2. Forewing with slight fuscous shape before subterminal line.

a^3 Forewing with the postmedial line excurved from below costa to vein 4.

a^4. Forewing with slight yellowish spot on outer edge of reniform .. .. *obtusa*.

b^4. Forewing with slight white spot on outer edge of reniform .. .. *sincera*.

b^3. Forewing with the postmedial line straight from below costa to vein 4.

a^4. Forewing with the antemedial line angled inwards on vein 1 .. .. .. *placida*.

b^4. Forewing with the antemedial line not angled inwards on vein 1 .. .. *cognata*.

C. Forewing with the reniform not defined by white points.

a. Forewing with the reniform filled in with black... *bicornis*.

b. Forewing with the reniform not filled in with black.

a^1. Forewing with black spot on costa at medial line.

a^2. Forewing ochreous white irrorated with black, the lines with black spots on them .. .. *vicina*.

b^2. Forewing greyish ochreous largely suffused with fuscous, the lines indistinct, fuscous .. .. *flavitincta*.

b^1. Forewing without black spot on costa at medial line.

a^2. Forewing with the orbicular a small dark spot .. .. *stygia*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

b^2. Forewing with the orbicular a black point.. *bimacula.*

c^2. Forewing with the orbicular absent .. *variana.*

1860. ATHETIS DELECTA.

1887*a*. ATHETIS PRÆTEXTA.

Caradrina prætexta, Swinh., A. M. N. H. (7) xv., p. 152 (1905); Hmpsn. Cat. Lep. Phal. B. M. viii., p. 316, pl. 129, f. 23.

Head and thorax grey tinged with brown; palpi blackish at sides except at tips; tarsi blackish ringed with white; abdomen grey suffused with dark-brown, the anal tuft of male yellow. Forewing grey-white irrorated and in parts suffused with red-brown; subbasal line double filled in with whitish, waved, from costa to submedian fold; antemedial line double filled in with whitish, angled outwards below costa and excurved below submedian fold; orbicular, a black point defined by whitish; reniform chocolate brown with whitish annulus, constricted at middle and slightly angled inwards on median nervure; a waved dark medial shade; postmedial line double filled in with whitish, slightly bent outwards below costa, then produced to double black points on the veins, oblique below vein 4, some whitish points beyond it on costa; subterminal line whitish defined on inner side by red-brown, slightly angled outward below costa and excurved at middle; terminal area suffused with brown; a terminal series of black lunules slightly defined on inner side by whitish; cilia brown with a waved white line through them. Hindwing greyish suffused with brown; an indistinct discoidal lunule; a terminal series of slight dark lunules from apex to vein 2; cilia yellowish white with a brown line through them; greyish irrorated with brown, a large dark discoidal spot, minutely waved postmedial line, incurved below vein 2, traces of a subterminal band, and a terminal series of small black lunules.

Habitat.—ASSAM, Khasis. *Exp.* 32 mill.

1879. ATHETIS DIVISA.

1863. ATHETIS AMBIGUA.

Noctua ambigua, Schiff. Wien. Verz. p. 77 (1776); Fabr. Mant. Ins. ii., p. 148 (1787); Staud. Cat. Lép. pal. p. 197.

" *plantaginis*, Hübn., Eur. Schmett. Noct. f. 576 (1802); Dup. Lép. Fr. vi., p. 59, pl. 76, f. 2; Herr. Schäff., Eur. Schmett. Noct. f. 381.

Orthosia uniformis, Swinh., Trans. Ent. Soc. 1885, p. 350, pl. 9, f. 6.

Caradrina hilaris, Staud. Cat. Lèp. pal. p. 197 (1901).

1887*b*. ATHETIS INTERSTINCTA.

Graphiphora interstincta, Moore, Lep. Atk. p. 118 (1883); Hmpsn., Cat. Lep. Phal. B. M. viii., p. 324, pl. 129, f. 27.

Head and thorax red-brown mixed with grey, the head paler; palpi black-brown, greyish at tips; tarsi fuscous with pale rings; abdomen dark

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

reddish brown. Forewing deep red-brown, slightly tinged with grey and with slight dark irroration; subbasal line black, curved, from costa to submedian fold; antemedial line black, bent inwards to costa and excurved above inner margin; orbicular a black point; reniform chocolate brown, rather constricted at middle, with a white point at upper extremity and two at lower; a diffused dark medial line, oblique from costa to lower angle of cell and angled inwards below the cell; postmedial line black, slightly bent outwards below costa, then with black points beyond it on the veins, excurved to vein 4, then oblique; submedial line faint, pale, defined on inner side by red-brown, excurved below vein 7 and at middle; a terminal series of minute dark lunules; a fine whitish line at base of cilia. Hindwing reddish brown tinged with grey; a fine whitish line at base of cilia; the underside whitish tinged with brown and irrorated with dark brown, a black discoidal spot, diffused curved postmedial line, and terminal series of small black lunules from apex to vein 2.

Habitat.—SIKHIM; BHUTAN. *Exp.* 36-40 mill.

1887*c*. ATHETIS LONGICILIATA.

Athetis longiciliata, Hmpsn., Cat. Lep. Phal. B. M. viii., p. 324, pl. 129, f. 28 (1909).

Head and thorax rufous mixed with a few dark brown scales; palpi black at sides except at extremities of 2nd and 3rd joints; tarsi fuscous with pale rings; abdomen pale rufous suffused with fuscous except the anal tuft. Forewing rufous tinged with grey and slightly irrorated with brown; subbasal line blackish, angled outwards below costa and ending at submedian fold; antemedial line blackish, oblique to vein 1, then erect; orbicular a blackish point; reniform a narrow lunule defined by diffused rufous, and with slight whitish points round it; medial line brown, rather diffused, oblique from costa to lower angle of cell, then inwardly oblique and sinuous; postmedial line brown, excurved from costa to vein 4, then oblique, with traces of a series of dark points beyond it on the veins; subterminal line yellowish, defined on inner side by brown suffusion, slightly excurved below vein 7 and at middle; a terminal series of black points; cilia with a fine yellowish line at base. Hindwing red-brown tinged with fuscous; a diffused blackish discoidal spot; a terminal series of slight dark lunules; cilia with a fine yellowish line at base; the underside whitish irrorated with dark-brown, a black discoidal spot, rather diffused curved brown postmedial line, and terminal series of small black lunules from apex to vein 2.

Antennæ with the cilia rather long.

Habitat.—ASSAM, Khásis. *Exp.* 36 mill.

1887. ATHETIS FASCIATA.

Graphiphora fasciata, Moore, P. Z. S., 1867, p. 54; Hmpsn., Cat. Lep. Phal. B. M., viii, p. 325, pl. 129, f. 29.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1857. ATHETIS BREMUSA.

1856*a*. ATHETIS HIMALEYICA.

Caradrina himaleyica, Koll. Hügel's Kaschmir, iv., p. 479 (1844), Hmpsn. Cat. Lep. Phal. B. M. viii., p. 335 pl. 130, f. 6.

" *arenacea*, Moore, P. Z. S., 1881, p. 349.

Head, thorax and abdomen grey-white slightly irrorated with brown; palpi black, white at tips; antennæ blackish except at base; tarsi black ringed with white. Forewing grey-white slightly tinged and irrorated with brown; subbasal line represented by a small black spot on costa; antemedial line indistinctly double, minutely waved, oblique, with black spot on the outer line at costa; orbicular a brownish point; reniform a narrow lunule defined by rufous, with some fuscous at lower extremity, two white points on inner edge and three on outer and a rufous point beyond it at middle; medial line with black spot at costa, oblique to the reniform and sinuous from lower angle of cell to inner margin; postmedial line indistinct, with black spot at costa, bent outwards below costa, then minutely waved and with some black points beyond it on the veins, incurved below vein 4, some white points beyond it on costa with slight black streak between them; subterminal line whitish, defined on inner side by small somewhat dentate rufous marks, angled outwards at vein 7 and excurved at middle; the terminal area suffused with fuscous; a terminal series of minute black lunules; cilia with a fine whitish line at base. Hindwing white slightly tinged with reddish brown, especially on the veins and terminal area; cilia white; the underside with the costal and terminal areas irrorated with brown, a small discoidal spot, postmedial series of minute streaks on the veins, and terminal series of small black lunules.

Habitat.—W. CHINA; KASHMIR, Goorais Valley, Scinde Valley; PUNJAB, Kulu, Dalhousie, Dharmsala, Umballa; SIKHIM TIBET, Yatong; SIKHIM. *Exp.* 32-36 mill.

1856. ATHETIS FUSCICORNIS.

Caradrina fuscicornis, Rmbr. Ann. Soc. Ent. Fr. 1832, p. 286, pl. 9, f. 5; Dup. Lèp. Fr. Suppl. iii. pl 29, f. 4; Staud. Cat. Lep. pal., p. 196.

Noctua kadenii, Frr. Neue Beitr. Schmett. ii., p. 147, pl. 186 (1836); Fisch. von. Rosl. Schmett, pl. 36, ff. 2.; a. b.; Dup. Lèp. Fr. Suppl. iii., pl. 29, ff. 2, a. b.; Herr. Schaff. Eur. Schmett. Noct. f. 408; Staud. Cat. Lep. pal. p. 197.

Caradrina proxima, Rmbr. Faun. And. pl. 18, f. 7 (1839).

" *variabilis*, Bell. Ann. Soc. Ent. Fr. 1865, p. 104, pl. 2 f. 1.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Craradrina farinacea, Moore, P. Z. S., 1888, p. 411.

1861. ATHETIS OBTUSA.

1862. ATHETIS SINCERA.

1859*a*. ATHETIS PLACIDA.

Radinacra placida, Moore, Lep. Ceyl. iii. p. 30, pl. 147, f. 4 (1884).

Head, thorax and abdomen pale rufous mixed with greyish; palpi black, white at tips; antennæ black; tarsi black ringed with white. Forewing greyish suffused with rufous and with slight dark irroration; subbasal line slight, dark, curved, from costa to submedian fold; antemedial line very indistinct, oblique, sinuous; orbicular a black point; reniform indistinct diffused, blackish, constricted at middle, with an ochreous point on its outer edge and slight whitish points round it; traces of a dark medial line, oblique from costa to reniform and sinuous below the cell; postmedial line slight, blackish, bent outwards below costa, then minutely dentate, incurved below vein 4; subterminal line defined on inner side by blackish suffusion, minutely dentate, excurved below vein 7 and at middle; a terminal series of black striæ. Hindwing white, the apex slightly tinged with brown; the underside with the costal area tinged with ochreous, a dark discoidal point and postmedial points on the veins from costa to vein 4.

Habitat.—CEYLON. *Exp.* 26-30 mill.

1854. ATHETIS COGNATA.

1865. ATHETIS BICORNIS.

1859*b*. ATHETIS VICINA.

Caradrina vicina Staud. Berl. Ent. Zeit., 1870, p. 118; Hmpsn Cat. Lep. Phal. B. M., viii, p. 355, pl. 130, f. 28, Staud. Cat. Lep. pal., p. 196.

„ *belucha*, Swinh., Trans. Ent. Soc., 1885, p. 348, pl. 9, f. 2.

„ *syriaca* Staud. Iris. iv, p. 294 (1892).

„ *fergana* Staud. Iris. iv, p. 294 (1892).

♂. Head and thorax ochreous white slightly irrorated with red-brown; palpi with black-brown patch at side of 2nd joint; tarsi blackish ringed with white; abdomen white. Forewing yellowish white slightly irrorated with brown, the terminal area suffused with fuscous brown; subbasal line represented by black striæ from costa and median nervure; antemedial line blackish with black spot at costa, oblique, interrupted; orbicular a small round brown spot; reniform a small lunule defined by blackish; medial line with black spot at costa, oblique to reniform, slightly sinuous from cell to inner margin; postmedial line much interrupted, with small black spots at costa. Submedian fold and inner margin strongly bent outwards below costa, slightly incurved at discal fold, incurved below vein 4, some yellow points beyond it on costa; traces of a pale subterminal line, excurved below vein 7 and at middle; a terminal series of small black

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lunules; cilia brownish with a fine pale line at base. Hindwing white, the veins of terminal area and termen slightly tinged with brown from apex to vein 2; a fine brown terminal line from apex to submedian fold; cilia tinged with brown at apex; the underside with small apical brownish patch and terminal series of small blackish lunules from apex to vein 2.

♀. Forewing with the terminal area hardly suffused with fuscous except before subterminal line.

ab. 1. *Fergana.* Forewing more distinctly marked but without the dark suffusion on terminal area . . . Armenia, W. Turkestan.

ab. 2. *syriaca.* Darker, the hindwing wholly tinged with fuscous . . Asia Minor, Syria.

Habitat.—SPAIN; S. RUSSIA; ARMENIA; ASIA MINOR; SYRIA; PERSIA; W. TURKESTAN; E. TURKESTAN; BELUCHISTAN, Quetta. *Exp.* ♂ 30, ♀ 32 mill

1859*c*. ATHETIS FLAVITINCTA.

Athetis flavitincta, Hmpsn., Cat. Lep. Phal. B. M., viii., p. 356, pl. 130, f. 29 (1909).

Head and thorax whitish mixed with brownish ochreous; palpi blackish at sides; tarsi black ringed with white; abdomen pale red-brown. Forewing whitish tinged with reddish ochreous and irrorated with brown, the terminal area suffused with pale fuscous; subbasal line represented by a black point on costa; antemedial line indistinct, double, with black point on the outer line at costa, then oblique and slightly waved; orbicular absent; reniform narrow, faintly defined by fuscous; a diffused curved waved medial shade; postmedial line indistinct, double, with black point on the inner line at costa, slightly bent outwards below costa, then minutely dentate, oblique below vein 4, some pale points beyond it on costa; subterminal line indistinct, pale, minutely waved; cilia greyish ochreous mixed with brown and with fine ochreous line at base. Hindwing white tinged with brown, the veins and termen brown; cilia white with a brown line through them from apex to vein 2; the underside white, the costal area irrorated with brown, the termen suffused with brown from apex to vein 2.

Habitat—PUNJAB, Kulu, Sultanpur. *Exp.* 32 mill.

1859*d*. ATHETIS STYGIA.

Athetis stygia, Hmpsn. Cat. Lep., Phal. B. M., viii, p. 357, pl. 130, f. 30 (1909).

Head, thorax and abdomen brown mixed with grey; palpi blackish, whitish at tips; tarsi fuscous ringed with whitish. Forewing grey tinged with brown and thickly irrorated with dark-brown; subbasal line brown, curved from costa to submedian fold; antemedial line brown, angled outwards below costa, then obliquely excurved; orbicular a small round brown spot with faint pale annulus; reniform elongate elliptical, brown with a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

faint pale annulus ; a rather diffused dark medial line, oblique from costa to median nervure, then inwardly oblique ; postmedial line indistinct dark, bent outwards below costa, then dentate and produced to dark points on the veins, incurved below vein 4, some pale points beyond it on costa ; subterminal line whitish defined on inner side by red-brown, almost straight ; a terminal series of slight black points. Hindwing grey suffused with brown ; a terminal series of slight dark striæ ; cilia with a fine whitish line at base ; the underside whitish thickly irrorated with brown, a black discoidal lunule and rather diffused curved postmedial line.

Habitat.—PUNJAB, Kulu, Sultanpur, Simla, Dharmsala, Kalapani. *Exp.* 26-36. mill.

1857*a*. ATHETIS BIMACULA.

Nebrissa bimacula, Wlk., Journ. Linn. Soc. Zool. vi, p. 194 (1862); Swinh., Cat. Het. Mus. Oxon. ii, p. 41, pl. 1, f. 22.

Caradrina terminata, Hmpsn., J. Bom. Soc. Nat. Hist. xi, p. 444 (1897).

1881. ATHETIS VARIANA.

Genus HYPOPERIGEA.

Type.

Hypoperigea, Hmpsn., Cat. Lep. Phal. B. M., viii., p. 422 (1909) .. .. *tonza.*

Proboscis fully developed ; palpi obliquely upturned, the 2nd joint reaching about to middle of frons and rather broadly scaled, the 3rd moderate ; frons with rather small truncate cornical prominence with slightly raised edges and corneous plate below it ; eyes large, round ; antennæ of male minutely serrate and ciliated, with a ridge of scaled between them ; thorax clothed chiefly with scales, the pro-and metathorax with spreading crests ; tibiæ moderately fringed with hair ; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved, crenulate ; veins 3 and 5 from near angle of cell ; 6 from upper angle ; 9 from 10 anastomosing with 8 to form the areole ; 11 from cell. Hindwing with veins 3·4 from angle of cell ; 5 obsolescent from middle of discocellulars ; 6·7 from upper angle ; 8 an a stomosing with the cell near base only.

A. Forewing with large white or pale patch at base.

a. Forewing with white or pale curved mark from middle of costa to apex .. .. *albonotata.*

b. Forewing with obliquely placed white patches from middle of costa to apex .. .. *leprosticta.*

B. Forewing without white or pale basal patch.

2024. HYPOPERIGEA ALBONOTATA.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Tatache albonotata, Hmpsn., Ill. Het. B. M. ix., p. 96, pl. 162, f. 22 (1893).

„ *plumbicula*, Hmpsn., J. Bomb. Nat. Soc. xvii., p. 475 (1906).

1717*e*. HYPOPRIGEA LEPROSTICTA.

1874*b*. HYPOPERIGEA TURPIS.

Acontia turpis, Wlk. xii, 794 (1857).

Caradrina discophora, Hmpsn., J. Bomb., Nat. Hist. Soc. xiv., p. 204 (1902).

Genus DYSMILICHIA.

Type.

Phalacra, Staud. Rom. Mém., vi., p. 568 (1892), Nec. Wlk. Lep. 1866 .. .. *gemella*.

Milichia, Snell. Tijd. v. Ent., xli, p. 194 (1898), Nec. Mieg. Dipt. 1830 .. .. *gemella*.

Dysmilichia, Speiser, Berl. Ent. Zeit., xlvii., p. 140 (1902). *gemella*.

Proboscis fully developed; palpi oblique, short, fringed with hair in front; frons with truncate conical prominence with raised edges and corneous plate below it; eyes large, round; antennæ of male typically ciliated; build slender; thorax clothed chiefly with scales and without crests; tibiæ moderately fringed with hair; abdomen without crests. Forewing short and broad, the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1834*a*. DYSMILICHIA CALAMISTRATA.

Ilattia calamistrata, Moore, P. Z. S., 1881., p. 348; Hmpsn., Cat. Lep. Phal. B. M., viii., p. 428, pl. 133, f. 12.

♀. Head and thorax rufous mixed with whitish; tarsi ringed with whitish; abdomen whitish suffused with rufous. Forewing deep rufous, a white point at base; subbasal line represented by a white point below costa; antemedial line represented by a white striga angled outwards below costa and white points on median nervure and vein 1; claviform absent; orbicular round, white defined by black; reniform figure-of-eight-shaped, with white annulus defined by black, interrupted at middle; postmedial line fine, rufous traversing a series of small elongate white spots defined by rufous, bent outwards below costa, then minutely waved, excurved to vein 4, then incurved, some white points beyond it on costa; subterminal line represented by white striæ from costa and inner margin, hardly traceable between those points, excurved below vein 7 and at middle; a terminal series of dark striæ; cilia with a slight dark line

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

through them. Hindwing whitish suffused with red-brown ; the cilia white with a brown line near base and brown spots at tips ; the underside whitish thickly irrorated with red-brown, a slight discoidal spot and curved diffused brown postmedial line.

Habitat.—SIKHIM ; ASSAM, Khásis. *Exp.* 26-30 mill.

Genus PROXENUS.

Type.

Proxenus, Her. Schaff. Eur. Schmett. ii., p. 240 (1845) .. *hospes.*

Radinogoes, Butl. Trans. Ent. Soc., 1886, p. 393 .. .. *tenuis.*

Proboscis fully developed ; palpi upturned, the 2nd joint reaching about to middle of frons, and moderately scaled, the 3rd short ; frons smooth ; eyes large, round ; antennæ of male typically ciliated ; thorax clothed chiefly with scales and without crests, build slender ; tibiæ moderately fringed with hair ; abdomen without crests. Forewing long and narrow, the apex rounded, the termen evenly curved and hardly crenulate ; veins 3 and 5 from near angle of cell ; 6 from upper angle ; 9 from 10 anastomosing with 8 to form the areole ; 11 from cell. Hindwing with veins 3·4 from angle of cell or shortly stalked ; 5 obsolescent from middle of discocellulars ; 6·7 from upper angle or shortly stalked ; 8 anastomosing with the cell near base only.

Sect. I. (*Proxenus*).—Mid and hind tibiæ of male with fringes of pale hair on outer side, abdomen with lateral fringes of pale hair on basal segments.

1889*a*. PROXENUS DISSIMILIS.

Proxenus dissimilis, Hmpsn., Cat. Lep. Phal. B. M., viii., p. 431 pl. 133, f. 15 (1909)

Head and thorax brown mixed with grey ; palpi black at sides, whitish in front and at tips ; mid and hind tibiæ of male fringed with whitish hair ; abdomen grey suffused with brown, the basal segments in male with lateral fringes of white hair, the genital tufts whitish. Forewing glossy brown irrorated with grey and dark brown ; traces of a double waved antemedial line ; orbicular a dark point ; reniform a small lunule slightly defined by brown ; postmedial line indistinct, double, bent outwards below costa, then waved, incurved at discal fold and below vein 4, the veins beyond it with dark streak to the subterminal line, which is greyish defined on inner side by fuscous, angled outwards at vein 7 and excurved at middle ; a terminal series of black points with whitish points between them. Hindwing white, the apical area and termen to vein 2 tinged with brown ; cilia brown towards apex with a fine white line at base ; the underside with the costal area irrorated with brown except at base, a slight discoidal point.

Habitat.—JAPAN ; SIKHIM, 1,800′; S. BORNEO ; PHILIPPINES. *Exp.* 24-30 mill.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sect. II. (*Radinogoes*).—Mid and hind tibiæ and abdomen of male normal.

1889*b*. PROXENUS TRISTIS.

Caradrina tristis, Brem. Lep. Ost. Sib., p. 49, pl. 5, f. 9 (1864); Hmpsn., Cat. Lep. Phal., B. M., viii., p. 437, pl. 133, f. 23; Staud., Cat. Lep. pal., p. 198.

Hydrilla lugens, Staud. Rom. Mem. vi., p. 490 (1892).

Head and thorax whitish suffused with pale brown; palpi whitish, fuscous at tips; tarsi with slight whitish rings; abdomen whitish tinged with brown. Forewing ochreous white suffused and irrorated with brown, the costal area whiter; subbasal line absent; faint traces of a waved antemedial line; orbicular represented by a small elongate black spot in cell, the reniform by minute black lunules on inner and outer sides; postmedial line very indistinct, bent outwards below costa, then dentate, incurved below vein 4; subterminal line absent; a terminal series of faint dark points. Hindwing white, the veins tinged with brown; a fine brown terminal line; the underside with the costal area irrorated with brown.

Ab. 1. *lugens*. Dark.

Habitat.—E. SIBERIA; KASHMIR, Goorais Valley, Nubra. *Exp.* ♂ 30, ♀ 28 mill.

Genus STYGIATHETIS.

Type.

Stygiathetis, Hmpsn. Cat. Lep. Phal. B. M., viii., p. 444 (1909) .. .. *mus.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately fringed with hair in front, the 3rd long, oblique; frons with short truncate conical prominence with raised edges; eyes large, round; antennæ of male fasciculate; thorax clothed with long hair and hair-like scales and without crests; tibiæ fringed with rather long hair; abdomen clothed with rough hair and with lateral fringes of hair but without crests, the claspers large. Forewing narrow, the costa and inner margin subparallel, the apex rounded, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1888. STYGIATHETIS MUS.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XVII with Plate XVII.

(*Continued from page 19 of this Volume.*)

As already stated in a previous paper (No. XVI of this Series), the boas and pythons are grouped together in a single family (*Boidæ*). They agree in possessing rudimentary hind limbs, but the pythons are grouped together in a distinct sub-family (*Pythonniæ*) characterised by the presence of a bone (the supra-orbital) which contributes largely to the roof of the orbit. In the boas on the other hand the roof of the orbit is formed as in colubrines, and most other snakes entirely by a lateral expansion of the frontal bone. The sub-family *Pythonniæ* comprises seven genera of which one only, *viz.*, *Python* is represented in our Indian Dominions.

The genus *Python* of which our Indian *molurus*, and the Papuasian *amethystinus* are the types, includes nine species distributed in Africa (*sebæ*, *anchietæ*, and *regius*), Malaya (*timorensis*, *reticulatus*, *curtus*), Australia (*spilotes*), Papuasia (*amethystinus*) and Asia (*molurus* and *reticulatus*). The two latter occur within Indian limits, and are dealt with in this paper.

Python molurus (LINNÉ).

THE INDIAN PYTHON.

History.—Pythons were well known to the ancients, and probably it was the Indian *molurus* among others with which they were acquainted. In scientific literature the first certain allusion to our common Indian species, is by Linné who described it under the name *Coluber molurus* in 1766. In 1796 Russell figured it no less than four times in his first volume (Plates XXII, XXIII, XXIV, and XXXIX).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Nomenclature (*a*) *Scientific.*—The name *Python* came into generic use in 1803, when Danderi associated this snake with that known to the ancients by this name.

The word *Python* seems to be derived from the Pythian Vale, in the mud of which the fabled monster of the Greeks was supposed to have been generated after the Deluge. Milton* refers to the event in the following terms :—

> "but still greatest he the midst.
> Now dragon grown, larger than whom the Sun
> Engendered in the Pythian vale on slime
> Huge Python ; and his power no less he seemed
> Above the rest still to retain."

Dr. Brewer† says the word is derived from the Greek "puthesthai" to rot, because the monster after being killed by Apollo was left to rot in the sun. The scene of the tragedy—Mount Parnassus—was immortalised by the erection of Delphi, the famous shrine of Apollo.

(*b*) *English.*—It is almost always known to the Anglo-Indian as the python, but sometimes is spoken of as the rock snake, by no means an appropriate name.

(*c*) *Vernacular.*—Throughout India it is pretty generally called "ajgar" the Hindustani for dragon, but has many other local names.

In Southern India it is frequently called by the Tamils "periya pamboo" which simply means "large snake." "Malai pamboo" or "hill snake" is also frequently in use by Tamils, and Father Bertrand, S.J., tells me in some parts the Tamils call it "Kaloodai viriyan" which means "ass viper." Russell mentions "pedda poda" as the name it is known by in the Ganjam District. This, am informed, is the Telugu for "large strikers," "poda" being he noun formed from the verb "potu" (pronounced more like "podu") to strike. Father Higglin, S.J., though has it on good authority that the word is "peda" a head, and that "pedda peda" means "large head," or "large serpent." In Mysore the Canarese name is "heba havoo" (large snake), but spoken by a native

* Paradise lost, Book X, line 528. *et. seq.*

† The reader's handbook of allusions, etc.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the words sound more like "hebbow." The Telugu name about the same part of India is "dasira pam" a very appropriate one for it, as the python bears on its head three light, often pinkish stripes exactly like the three white stripes of the Hindu caste mark worn on the forehead and called by them "dasira." I am told that about Cuddapah it is known as "condasella." "Conda" is the Telugu for rock. Russell mentions "bora" as one of its names but I think this is generally applied in Bengal to the Russell's viper and not this snake. The two species being of somewhat similar build are often confused not only by natives, but by Europeans too.

In Ceylon all recent authorities concur in stating that the Singhalese name for it is "prinbera." The famous John Ray* however says that the name "anaconda" is Singhalese, and not South American as one might suppose. His friend Dr. Tancred Robinson gave him a catalogue of the Indian snakes he had noted in the Leyden Museum. No. 8 on this list read as follows:—"8 serpens indicus bubalinus anacandaia Zeylonensibus, id est bubalorum aliorumque jumentorum membra conterens." Colonel Yule† says he can find no mention of the name anaconda in old South American literature, and suggests that it is derived from the Singhalese "anai" elephant, and "kondra" which vanquished. I have failed to get any confirmatory evidence on this subject from Ceylon.

The Burmese throughout their Province call it "Sa-ba-ohn."

In South China I heard it called "hiang-zo" meaning "aromatic snake," a name probably suggested by its cooking flesh, since it is very savoury fare according to Chinese ideas. Swinhoe‡ mentions the name "vang" which is in common use among the Chinese in the Island of Hainan.

General characters.—The python is an extraordinarily massively built snake, and its development perhaps the most remarkable character it exhibits. Its girth relative to its length considerably exceeds that of all other snakes, except its own close allies. The body is thickest in the middle, reduces perceptibly towards the

* Syn. animal-quad. et Serp. 1693, p. 332.

† Hobson Jobson. ‡ Nat. Hist. of Hainan, 870.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

head, and the anus. It is rounded in outline, smooth, and if the snake is in good condition glossy. The neck is distinct. The head is very distinctly flattened, has a remarkably long snout fully four times the length of the diameter of the eye in adults, and a faint indication of a *Canthus rostralis*. The nostrils are large, open, directed upwards and placed high on the snout. The eye is very small, with an iris finely sprinkled with gold, and a vertical pupil. The rostral shield and the two first supralabials are deeply pitted or furrowed, a peculiarity only seen in this genus among Indian snakes. What these depressions really are, it is difficult to say, but I have noticed in dissecting out skulls that very highly developed nerves run through foramina in the maxilla corresponding with these pits and appear to me to ramify subcutaneously in them. It would appear from this that they may be sensory organs. Beneath the chin is a longitudinal furrow, the mental groove. The tail is short and prehensile, tapering rapidly and is about one-seventh to one-eighth the total length of the snake. Above the anus on each side is a carved claw-like process, the termination of the rudimentary limb, and which is more highly developed in the male.

Colour and markings.—On the head these vary a good deal with age, and in all individuals vary much according to whether desquamation has been recently completed, or is impending. The ground colour is greyish, whitish, or yellowish in adults, and often a very pretty shade of pink, in the young especially. There is a dark streak from the nostril to the eye in the young which often is completely obliterated in later life. Behind the eye at all ages is a conspicuous, dark, oblique band to the gape, and a more or less conspicuous patch below the eye tending to become obscure with age. On the front part of the lower lip there is often some fine mottling. On the back of the head and the nape is a large lance-shaped mark bisected in the median line, but this often fades so much anteriorly in adults that the similitude to a lance is more or less effaced. The light bisecting band, together with similar light bands, one of which passes over each eye-brow—especially distinct in the young—are very suggestive of the "dasira" mark already alluded to under vernacular nomenclature.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Dorsally the body is greyish or yellowish, and bears a series of large, somewhat roughly quadrate, patches extending from the neck on to the tail. These patches which are centrally much the same colour as the ground are well defined outwardly, and broadly outlined with black or blackish, and it is here that those lovely bluish and amethystine hues are seen in certain lights which show off the snake to such advantage, and which many an artist in the Royal Academy has tried, with varying degrees of success, to depict. Outside this median series of marks is another small series of a similar character, and outside this again a third sometimes, much less regular and smaller and mixed up with a coarse mottling extending into the flanks. The underparts are dirty-whitish, or faintly yellow. Seen in the sun's rays the iridescent effects on the dorsal patches defy alike the author's powers of description and the painter's art of reproduction. Virgil's * description however of the snake that encircled the tomb of Anchises, and which Kennedy has so graphically rendered in English verse as follows, leaves no doubt, but that it is a python that is indicated, and as likely as not our Indian species *molurus*.

"Scarce had he said when from the shrined base a slippery snake trailed huge seven coils, in each seven folds; and circling tranquilly the tomb slid o'er the altar; dark blue streaks its back lit up, its scales a sheen of spotted gold as (when the sun shines opposite) the bow darts from the clouds a thousand varied hues."

"Circling tranquilly" and the comparison of its colours to that of the rainbow are so graphic that one feels Virgil must have seen a python moving with the sun glancing upon its scales.

Identification.—The Python is a very easy snake to identify. The pits in the first two † upper labials will serve to distinguish it from every other Indian species. Only one other has those pits at all and this is its ally *P. reticulatus* which has the first *three* or *four* shields pitted. In case the head has been too mutilated to be certain of this point, attention should be directed to the costals. There are only three Indian snakes with the rows exceeding 50 in midbody, *viz.*, *Eryx johni*, *P. molurus*, and *P. reticulatus* which are

* Æneid Lib. V line 84, *et. seq.*

† Care must be taken not to count the pits on the foremost shield—the rostral.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

easily separated by the number of ventral shields, *i.e.*, from throat to vent. In *Eryx* they are 192 to 210, in *molurus* 242 to 265, and in *reticulatus* 297 to 330.

Dimensions.—It is difficult to say with certainty to what length the python may attain. It seems probable that many of the great lengths given by travellers and sportsmen were guessed at, and the snake not actually measured. The creature is very thick relatively to its length, perhaps three or four times the girth of a Russell's viper of similar length, and five or six times that of a dhaman (*Zamenis mucosus*). If a python's length were judged from its girth, the estimate would grossly exceed the real measurement.

Specimens of 10 feet are not very uncommon, as will be seen from the following records, and there is little doubt that it exceeds 20 feet. In this Journal * Ferguson records an 18 foot one from the Ashambu Hills, and Major Begbie † one of a similar length killed near Baksa Duars. Other specimens of like proportions have been recorded by the late D. Ferguson in Ceylon‡, and in the *Pioneer* from Rajshai (Rajapur).¶ I saw the skin of a specimen of the same length in the possession of Mr. A. M. Harry in Assam. Mr. Prince of the King's Own Shropshire Light Infantry shot a female in the United Provinces in 1906 which measured 18 feet 3 inches. In *Land and Water* (August 10th, 1866 or 67?) one is mentioned from Mussoorie of 18 feet 9 inches. Tennent** refers to a specimen brought him in Ceylon that taped 19 feet. Another reported of a similar length was encountered by Captain George and Mr. Delsuage when shooting in Ceylon. This was captured and brought to Colombo, and exhibited in 1885 when I saw it. Jerdon †† saw a 19 foot specimen killed in Travancore, and Dr. Elmes told me of one he shot in Assam (N. Lakhimpur District) of the same size. A specimen measuring 19 feet 2 inches in our Society's collection, shot by the late Maharajah of Cooch Behar

---

* Vol. X, page 69.

† Vol. XVII, page 1021.

‡ Rept. fauna, Ceylon, p. 22.

¶ 3rd July 1907

** Nat. His. of Ceylon, II, p. 153.

†† Journ. As. Soc., Bengal, XXII, p. 526.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in Assam was originally reported in this Journal * as a Malayan python (*P. reticulatus*). Captain Percival † says he saw one in Ceylon 22 feet long, and the specimen mentioned by John Ray, and stated by him to be in the Leyden Museum was, he states, 25 feet (I have not been able to get confirmation of this from Leyden, but notice that Dumeril and Bibron refer to one in that Institution 20 feet). Elliot ‡ claims that it grows to a length of 30 feet, and if this opinion were confirmed I think India could lay claim to the two largest species of the genus, for *reticulatus* is also reported to attain to a length of 30 feet. Within quite recent times (1905) a specimen of the latter in the possession of Mr. John Hagenbeck was, as far as could be ascertained, in life 28 feet. The African species *sebae* is also a very large reptile which is recorded up to 23 feet.

The weight of a python is remarkable, the specimen of *molurus* killed by the Maharajah of Cooch Behar, which measured over 19 feet, scaled 200 pounds (over 14 stone). Mr. John Hagenbeck's reticulated python just alluded to weighed 250 pounds.

Haunts.—For the most part the Indian python is a jungle inhabitant. It may be met with in the interior of the densest forest tracts, or in sparser forest growth such as that which clothes the rocky slopes of many low hills. Where jungle is not available it most usually attaches itself to rivers and jheels, especially the former. In jungle areas it is frequently observed in trees and at times at some considerable elevation aloft. It climbs stealthily but well, and having established itself in the branches secrets itself so well that it is no infrequent event for a monkey to come within striking distance, and forfeit its life. By means of its prehensile tail it is capable of suspending itself from branches, nearly all of its body remaining free, and there is no doubt that many an incautious animal comes within reach, and is victimised. Mr. Sharpe, D. S. P., in the Fyzabad District, told me in 1906 that he once climbed up into a banyan tree in dense jungle with his shikari, who told him that at that season when the fruit was

* Vol. XIII, p. 718.

† The Island of Ceylon, 1805, p. 311.

‡ Rept. Brit. Ass., 1870, Trans., p. 115.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ripening many animals especially deer visited these trees to eat the fallen fruit. After having been quiet for some time, he noticed close to him a movement in what he had up till then taken to be an aeriol root, but which on closer inspection proved to be a python suspended by its tail, and evidently established there for the same purpose that had actuated the sportsman. I have heard of pythons quartering themselves in hollow trees, and frequenting those on which egrets and night herons roost, to which at night the pythons stealthily crept and successfully took toll of.

In water this snake is quite at home, in fact it might be considered semi-aquatic in habit. It swims deftly and strongly, when its inclination prompts such activity, but is often to be observed partially or wholly submerged near the bank of a river, or jheel. As in captivity, it will lie for hours showing nothing but the tip of its snout, which is pushed out to raise the nostrils above the surface, and permit breathing. It can remain beneath the water entirely for many minutes. Colonel Fife Cookson * says that observations were made at Regent's Park which showed that it could keep entirely submerged for half an hour. I asked the attendant at Cross' Menagerie in Liverpool some years ago to make special observations in this direction, and he told me later that one kept its head below the water for 11 minutes, and remained above 9 minutes subsequently before again retiring below. Another kept below 12 minutes, and another 15 minutes.

If only partially submerged in water in its native haunts it keeps so still that any part of the body exposed is likely to be taken for a branch or root. My informant at Cross' Menagerie also told me that one kept in its bath from Wednesday till Sunday of one week, and often the sloughing period is passed in their tanks, from which the snake emerges resplendent in its new attire.

It is evidently a thirsty reptile, and in consequence probably is often impelled towards water for this reason. The dam in Paris in 1841 after accomplishing her maternal duties, and successfully launching forth her brood, drank eagerly swallowing

* Tiger shooting in the Doon and Ulwar, p. 31.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

some two tumblerfuls of water, and the young too were observed to slake their thirsts. In drinking it does not fill the mouth, and throw back the head like birds, nor does it protrude the tongue and lap, but puts its mouth to the water, and imbibes like a mammal, the gulping movements of the throat being plainly visible.

Occasionally the python has been reported at sea, but it is probable that it has drifted thence on a log, or in the current of a flooded river. It shows no special affection for the sea.

Habits.—In spite of its cat-like pupil the python is very much on the alert during the day time, and very frequently when encountered in its native haunts is found in the act of swallowing some animal captured in broad daylight. On the other hand it is frequently on the move at night, for on many occasions where it has entered a poultry run, its depredations have been committed under cover of darkness.

Its size, beauty, and placid disposition make it a welcome addition to the snake charmer's stock-in-trade, so that scarcely a member of the fraternity is without one. It is therefore in India a very familiar creature to everyone. The juggler produces his specimen with some ostentation from a bag or basket, seeking to impress the on-lookers, and he trades upon the public's natural fears, for if one comes forward too close to inspect the creature, it is more than likely that the owner affects the greatest alarm for his safety, as though to foster the belief already prevalent in the assembled throng that it is to him, and him only that the snake is a peacefully inclined and harmless creature.

The python in all parts of India where there is an attempt at a cold season hibernates, retiring for some months to any convenient retreat, a hollow tree, or hole in a bank, or, in the hills, any natural crypt or cave of convenient size. In Dibrugarh once I found one in February beneath a log on the banks of the Brahmaputra. It was extremely somnolent. Sometimes one hears of several congregating in the same retreat. In the *Pioneer* (19th February 1906) is an account of six pythons being discovered in a cavity in the bank of a stream in Mysore. One after another was seized and dragged out and all ranged between 10

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and 12 feet in length. I have also read of a similar occurrence in the Himalayas, though I cannot now lay my hands on the reference. A python was observed in a cave, and the raconteur with his Gurkha orderlies succeeded in extricating several, three or four, if I can rely on my memory.

It seems to me remarkable that in Southern India the python does not hibernate in the Plains, at least Colonel Dawson tells me it does not in Travancore, and Dr. J. R. Henderson says it does not in Madras in captivity, yet in Bombay which can lay no better claim to a cold season, a specimen caged in our Society's rooms hibernated for some months. Phipson* made some very interesting observations on this specimen at this period. Between the 21st December and the 13th of April, a period of 113 days, the snake refused food, and remained in a very sluggish, sleepy condition. It was noticed that its temperature fell from 82°F. (which had previously been the normal) to 73°. Two rats eaten on the 21st December were retained undigested until the 28th of February when they were thrown up. On ordinary occasions in the hot weather it had been recorded that a similar meal took about 8 days to digest. Desquamation during these months of lowered vitality did not occur, an interval of nearly seven months elapsing between the sloughing periods, though in the rest of the year this process was observed four times.

The movements of the python are very laboured and slow, in fact its mode of progression cannot be called anything but a crawl. This I believe to be due to the very narrow limits of the ventral shields, to the extremity of which the ribs on which the creature moves are fixed. The ribs are in consequence very much bowed, and only about half the body breadth—the middle two-fourths—are supported, leaving one-fourth overlapping each side. During progression waves of motion can be seen beneath the skin following one another in quick succession, corresponding to the movement of the ribs beneath, and reminding one of a similar series of wave-like successions seen in the legs of centipedes and millipedes whilst in motion.

---

* Jourl., Bomb. N. H. Soc., Vol. II, p. 166.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Disposition.—Our Indian python is one of the most lethargic of snakes, and as such an uninteresting creature in the vivarium. In captivity it passes the day in lazy apathy, sometimes lying upon, or partially encircling the branch usually put into its cage, sometimes convoluted into a heap on the floor, or as frequently reclining partially or wholly immersed in its bath of water. In any of these attitudes it is familiar enough to every one who has visited the reptile house in our various zoological gardens. It is wont to lie for hours together without a movement in spite of the stream of spectators peering into its cage, and their repeated attempts usually in vain to rouse it to activity by drumming upon the glass, flourishing handkerchiefs, and other objects before it. This apathy many might suppose the outcome of a familiarity which breeds contempt even in animals that are naturally of a fierce disposition, but even in its natural haunts it seems to behave in very much the same way, exhibiting little if any timidity, rarely rousing itself seriously to escape, and even when attacked making no attempt to avenge offence or injury. It thus becomes an easy victim to those who seek to kill it, or an easy capture to those of a more courageous and venturesome spirit. Even the female that shows such unremitting devotion to her parental duty of incubation will suffer herself to be captured with her brood of eggs with little or no remonstrance. In Travancore in 1903 a 15 foot dam, with eggs as it proved on the verge of hatching, allowed herself to be boxed; and conveyed to Trivandrum without offering any resistance. Similarly in Balrampur Mr. Oakes told me that two large pythons, one a dam incubating eggs, were easily captured alive and brought in from the jungle, the female continuing her duties and successfully hatching out her eggs. Six to eight foot pythons have several times been brought in to me found basking on a log, or in a boat on the river. These seemingly allowed themselves to be captured by a couple of coolies with little or no attempt at escape, though nothing could have been easier than one wriggle and a plunge into the water. Father Dreckman met with one just under 20 pounds in weight when walking with a friend in jungle. It was seen leisurely crossing their path. His friend went for its tail, while Father Dreckman

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

negotiated the head, expecting a hard struggle, but except for an ineffectual snap at his face, the snake allowed its neck to be seized, and its head to be thrust into a bag, into which the rest of its body was unceremoniously huddled without remonstrance.

Strength.—It seems very strange that a creature possessing such a massive and muscular body and such gigantic strength that it can overpower a leopard with ease, does not show a more aggressive spirit. Few people who have not handled a python in life can have any conception of the strength at its command. A brother of mine in the Straits told me he had several times measured large pythons in life, and that it takes as many coolies as one can put in the length of the snake to hold it, and even then they were unable to straighten it properly. Buckland* relates an incident which happened off the Coast of Ceylon, where a python effected its "footing" on a ship lying at anchor. When captured it encircled a water butt on deck, and compressed this so violently that the staves were contracted so as to allow the middle hoops to fall on to the deck.

Food.—The python, as the following remarks will testify, is practically omnivorous. It feeds on mammals, birds and reptiles indiscriminately, but seems to prefer mammals of relatively large proportions.

Its courage and power may be estimated by the fact that it has been known to overcome and devour a full-grown leopard (*Felis pardus*), sustaining but trivial injuries in the encounter. Thus Major Begbie in this Journal† related the circumstances leading to the death of a python by coolies, which subsequent dissection showed had eaten a leopard measuring 4 feet 2 inches from nose to rump. The snake was 18 feet long, and except for seven claw cuts appeared to have escaped unhurt.

Encounters with tigers also occur, but in the only instances known to me, the snake had the worst of it. Whether it was the aggressor in these contests it is impossible to know. Mr. Inverarity‡ after killing a tiger found some 2 feet 3 inches of the tail

* Curiosities of Nat. Hist., p. 182.

† Vol. XVII, p. 1021.

‡ The Great Thirst Land, p. 147.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

end of a python in the stomach. Another proof of a similar encounter is through Professor Von Linston * who found a tape-worm taken from the intestine of a tiger killed in the United Provinces, was of a species known to inhabit the python, which it must previously have eaten.

Many are the records of its having eaten deer. Jerdon† mentions one having eaten a cheetal (*Cervus axis*). Dr. Elmes told me that he saw a hog deer (*C. porcinus*), cut out of a python killed by a neighbour, and the horns he thought must have been fully a foot long. The 18 footer that Mr. Harry had killed on his estate in Assam had swallowed a barking deer whose horns were four inches or more long. Mr. Copeland had a 15 foot snake killed on his estate while I was in Assam, which was proved to have swallowed a hog deer.

The Rev. Cortets, S.J., wrote to me of a sambur fawn (*C. unicolor*) being devoured whilst the dam stood by helpless. Tennent mentions a chevrotain (*Tragulus meminna*) being eaten by one in Ceylon. Colonel Channer‡ recorded one in this Journal that had killed a langur monkey which lay in its coil at the time of encounter. The snake proved to be 12 feet 10 inches long. The attendant at Cross's Menagerie in Liverpool told me that one of their pythons got loose, and ate a monkey with the collar and chain that were attached to it, on which account probably it disgorged its meal some two days later. In the *Pioneer* of the 13th July 1907, an 18 foot python, killed at Raj Shahi, was found to have eaten a jackal (*Canis aureus*).

In the Philosophical Transactions¶, a gentleman is reported to have found a snake on an Island near Bombay lying dead with the quills of a porcupine (*Hystrix leucura*) sticking out through its ribs. We may assume that the snake was a python, as no other Indian species could swallow such an animal. I have also seen masses of porcupine quills that had passed in the dung of pythons. These softened by the digestive juices had been matted into

* Ind. Mus. Rec. II, pt. 1, p. 108.

† Jourl. As. Soc. Bengal, XXII, p. 526.

‡ Vol. IX, p. 491.

¶ Vol. XLIII, 1744, p. 271.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

masses which were hard to unravel, the quills having regained their texture after drying.

In *The Field* of 21st December 1907, Mr. Thwaites relates having seen a python in Ceylon spring at a hare (*Lepus nigricollis*) that was racing by. Ferguson in this Journal* reports an 8 footer at Quilon that had killed a kid.

Birds are frequently preyed upon by this snake. Mr. Thwaites† mentions a peacock in the coils of a python in Ceylon, and Colonel Evans‡ knew one in Burma eat a pheasant (*Gennæus lineatus*). One when I was in Dibrugarh was killed in the act of swallowing a chicken. Mr. Staunton killed one in Assam that had swallowed three of his ducks, and another made an unwelcome visit to Dr. Elmes' fowl-house, accounting for five ducks, four fowls, and one pigeon of his stock, all of which had been swallowed, giving the snake a beaded appearance. Dr. Elmes shot another which he saw lying in a bhil (lake) and found the following in its stomach:—two large and two small water rats, and two or three toads. Reptiles sometimes furnish the repast. Mr. Millard in this Journal ¶ records one in our Society's rooms swallowing a monitor lizard (*Varanus bengalensis*), a rat, and two frogs in quick succession. In its native jungles it sometimes comes into conflict with other large snakes, for Mr. Donaghey told me that coming back to camp one day in Burma his coolies produced two snakes which they said they had discovered fighting, and which they killed. These proved to be a *Python molurus*, and a hamadryad (*Naia bungarus*). They reported that the python had closed its jaws on the hamadryad and secured it fast. I saw and examined the two skins. The hamadryad measured 10 feet 3½ inches, and the python 7 feet 11 inches. In the former skin at the junction of the middle and the posterior third was a rent 3½ inches long corresponding to the python's grasp. It is impossible of course to surmise which was the aggressor in the fight, but the python though smaller was giving a good account of itself.

The most curious meal that I have had reported to me was a double handful of earthworms, and a handful of the berry called

* Vol. X, p. 69, † The *Field*, 21st December 1907.
‡ Bom. N. H. Jourl. Vol. XVI, p. 520. ¶ Vol. XVI, p. 757.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

by natives "jaman". My informant was Mr. J. H. Mitchell, a planter in Assam.

In captivity the python usually eats heartily and frequently, accepting anything that is offered, as the following annual bills of fare will show :—Phipson* says one in Bombay ate 23 rats, 3 hens, 3 crows, and 1 kestrel. One in Madras† ate 82 jerboas, but would not touch house rats; another ate 59 jerboas, 8 squirrels and 2 quails; a third accounted for 37 rats, 21 squirrels and 3 quails.

In Travancore one ate a spotted deer and 11 fowls; another 1 nilghai fawn, 1 hare, 1 rabbit, 13 fowls, and 1 pond heron; a third ate 14 fowls and 1 crown pigeon; a fourth 2 dogs, 2 hare wallabies, 2 bandicoots, and 54 fowls, a fifth 4 bandicoots, 19 fowls, and 1 spotted dove, and a sixth 1 hare wallaby, 1 bandicoot and 15 fowls.‡

It not infrequently happens that where two are caged together both strike at the same animal, and begin to shallow from opposite ends till their noses meet, when if one does not relinquish its hold, one gets its jaws over the other and swallows its mate. This happened once in Regent's Park and once in our Society's Rooms¶ when both struck at the same partridge, and similar occurrences have been reported in other institutions where snakes are kept.

The young which hatched out in Travancore are reported to have eaten the rats offered to them.

One sometimes hears of human beings being swallowed by pythons, but though I have collected several instances of other large snakes overcoming men I have no authentic instance of this snake doing so, but it is amply capable of overpowering the strongest man. A young European told me once in Hong Kong that he had witnessed as a boy with his brothers, a large snake (almost certainly a *molurus*) swallow a Chinese baby on Stone Cutter's Island in the Harbour. The mother left the child while engaged in some work, and the boys were afraid to encounter so formidable

* Jourl. B. N. H. S. Vol. II, p. 166. † Kindly communicated to me by Dr. J. R. Henderson.

‡ For this information I am indebted to Colonel F. W. Dawson.

¶ Jourl. Bomb. N. H. S. Vol. XIV, p. 395.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a snake. Major Sealy of the 4th Gurkhas tells me that a reliable old Gurkha Officer told him that once when officiating at a funeral pyre, a python emerged from the water hard by, seized the corpse, and made off with it.

Usually in captivity live animals have until recently been given to the snakes in various Zoological gardens, but now that it is known that pythons among other snakes will accept dead food, the order has changed. The fact that they would eat dead animals was noted 15 years ago in this Journal by Ferguson* who says "they will eat a dead rat, or rabbit, just as readily as a live one." He further states that under these circumstances it makes no attempt to constrict, but proceeds to swallow at once. In Regent's Park for some years now, many of the snakes have been fed entirely on dead animals.† Dr. Chalmers Mitchell, who paid special attention to this, says it was not noticed that it made any difference whether the food was freshly killed, warm, or bleeding, or if dead for sometime. It was noticed that in many cases the prey was not taken until night, and this was particularly the case when pythons took large animals like goats. He further states that the pythons showed their readiness to feed by special restlessness and activity, often leaving the tanks in which they have been lying previously, and that they are specially alert when they hear movements in the passage behind their cages, or when the back door are moved, and in the words of the keeper "they are asking for food.†"

The habit of constricting is characteristic of the whole family—boas and pythons alike. The snake, roused to activity by the sight of food, advances towards its prey often with quivering tail and makes a sudden dash at it with open jaws, which are no sooner closed upon its victim than it throws a coil or two—according to the size of the quarry—round it, holding it as in a vice until its struggles have completely ceased when it relaxes its embrace and proceeds to swallow it almost always beginning at the head. Dr. Chalmers Mitchell says "there appears to be no special attempt to crush the prey, to suffocate it or to break its bones." I

* Vol. X, p. 69. † Dr. Chalmers Mitchell, P.Z.S., 1907, p. 785, *et seq.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

certainly agree that there is no attempt to crush with the intention of breaking bones, and so making the mass more easy to deal with, but if the victim is not suffocated how is it killed? My belief is that the vigour of the embrace is such that the victim's chest is incapable of expansion, and asphyxia results, or what amounts to the same thing the heart cannot beat against the pressure to which it is subjected.

In swallowing a small animal the mouth is widely opened, and the jaws fixed beyond the head of the victim which is easily engulfed. Prior to the actual seizure of the head, the python plays about over it with quivering tongue. It does not slaver over it as is commonly supposed, but the saliva flowing freely under the stimulus of food wets that part which has been received in the mouth, so that if the victim has been disadvantageously seized, and the snake rejects it to make a second attempt, the part of the quarry previously injested is coated with saliva.

When the animal is large, the snake seizing the head strives to fix its teeth as far back as possible over the victim, when, having got a firm purchase, the jaws—six in all and all moveable—work alternately over the head, one or more at a time relaxing their hold to be pushed further forward and obtain an extended purchase while the others retain the hold already gained. The process is sometimes a tardy one, and if so the snake is frequently observed to protrude its wind pipe, so that an inch or even two may be seen beyond the mouth, beneath the mass that is engaged within the jaws. This extension of the glottis is however not a peculiarity confined to the python, for it has been noticed in several other snakes, colubrines and vipers.

It is popularly supposed that after a large meal, the python lies torpid, in a condition of satiety, until digestion has far advanced. I very much doubt if this is the true explanation of the disinclination of the snake to move under such circumstances, a disinclination even greater than it displays at other times. I think it is much more likely that in many cases the snake is so distended that it is afraid to move on account of internal injuries it may receive in the attempt. Undoubtedly accidents do occur which must end fatally. In the case already referred to where a dead

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

snake was found, with the quills of a porcupine it had devoured, penetrating its flanks between the ribs, it is probable that the injuries were received whilst moving before the quills had softened under the influence of the digestive function. A python already referred to, which was killed by Mr. Copeland's coolies in Assam, refused to move from its refuse in the jungle though surrounded by a howling mob of coolies. After sometime, the sustained apathy it exhibited stimulated the courage of the men who advanced by degrees nearer and nearer till they actually probed it with sticks and bamboos, and made the situation so untenable that the snake was forced to bestir itself. In trying to get away the horns of a hog deer, which it had swallowed, penetrated its flanks. It was finally despatched, and measured 15 feet. The horns of the deer were about 7 or 8 inches long. Such accidents are not very uncommon in snakes of all kinds—from over-distension, or from mechanical causes, the beak of birds, claws of various animals, etc.,—and I have collected quite a number of incidents of the kind.

The old traveller's stories of pythons, boas, etc., swallowing stags is not borne out by modern observations. I doubt if a python ever kills any deer with horns it is not capable of swallowing. If it does then sooner or later it has to relinquish its victim. The old books that led one to believe that the stag was swallowed up to its antlers, which projected from the mouth, and remained *in situ* till the head rotted off certainly misled us. The only way in which the body could be retained, and the head rejected would be by a slow decomposition (not a digestive process) separating the head at the neck joint, a process that would probably take several weeks to accomplish, and would exhaust even a python's patience. The body of a stag in such a position would not reach the stomach, and would not be subjected to any digestive action, for the saliva is inert to animal tissues. Further I doubt whether the lung could fulfil its function satisfactorily even with the small oxygen requirements of a snake, when subjected to the great and continued pressure of a carcass like a stag's.

The digestive powers of a python depend naturally on its general health. Phipson found that in the hot weather in captivity

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

small creatures like rats and crows were completely digested in about 8 days. McLeod* mentions a goat with horns being swallowed that took 3 weeks to digest.

In a vigorous snake every part of the animal swallowed is completely digested except epithelial structures such as hair, feathers, quills, teeth, the beak and claws, the scales of reptiles, the cornea, or, in snakes, the disc before the eye which is the analogue of the eyelids in other animals. If the dung is inspected these structures will be found massed together, and often retaining in a wonderful degree the relationship occupied in the animal injested. In sickly snakes, or in those whose vitality is impaired, when hibernation is approaching, bones will be found passed in a more or less imperfectly digested state. In the excrement also may be seen circular spaces which are believed to be casts from the snake's intestine. Similar spaces were observed in the coprolites, or fossillised dung of the old reptilian monsters—*icthyosaurus* and *plesiosaurus*—by Buckland, who remarks upon them in his Bridgewater Treatise.

Mr. Kinnear tells me they are frequently asked by visitors to our Society's rooms, if pythons reject the horns of deer and stags eaten. I cannot speak positively upon this point, which however is one that could easily be demonstrated in our Society's rooms using goats as victims. I have never heard it suggested that they disgorge the horns, but this is one of the many points touched upon in this paper about which I feel many of our readers could give more satisfactory information than my limited experience permits me to dilate upon. I believe however that the horns like other epithelial appendages are passed intact in the dung.

Though we have shown that the python as a rule feeds well in captivity, sometimes it will refuse food for long periods, and without suffering perceptibly. Ferguson† records one that fasted for over a year in the Trivandrum Gardens, but changed its skin more than once, and always looked glossy and in perfect health. After this fast it ate a white rat, and later again two more.

---

* The Voyage of H. M. S. "Alceste."

† Jourl. Bomb. N. H. Soc., Vol. VI., p. 424.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Uses.—In the arts, the skin of the python, in common with the skins of other snakes and lizards, is made up in various ways, as reticules, purses, letter cases, etc., but for trade purposes it is but sparingly used owing to the difficulty in procuring skins in any quantity. Nearly all large specimens are skinned by those who kill them, the skins being retained as trophies which one frequently sees adorning the walls of bungalows in this country. Sometimes these are cut up, and I have more than once seen belts made of them.

All through the East certain natives regard the flesh of this snake very highly, and I can quite believe that it may be excellent. The traveller D'Albertis when in New Guinea shot a closely allied snake to the python (*Liosis albertisii*) 19 foot long, which he tasted when the natives with him had cooked it for their own purposes. He said that it was "not so bad" though tough and too sweet, but pronounces the soup made from it as excellent. Only recently it was reported in the papers that at a fashionable dinner in Paris, as a novelty, python steaks were served and reported "very good." In Southern China I know it is eaten as a great delicacy. In Burma the Karens and Burmese both regard it as excellent fare, and no python met by them is likely to be spared for this reason. In Travancore Colonel Dawson tells me the hillmen eat the snake and its eggs too. In *Land and Water* (August 10th, 1867) a correspondent says that a gipsy tribe in the Dun eat pythons, and Mr. Mackinnon tells me that there is a tribe called Myhras inhabiting the Dun that are ophiophagous. Many Indian people are snake-eaters, and as such are not likely to disdain the flesh of the python. Such are the Santhals, who occupy a strip of country between the Ganges and the River Baitarani, the Oraons or Dhangars, and Kols of Chota Nagpur, the Garos of the Garo Hills, Assam, the Nats, a nomadic gipsy caste, the Chentsus of the Nallamalley Hills, the Kanjars of the United Provinces, and according to a Mr. Edwin, who wrote to a London paper in 1768, the Ceylonese too, and doubtless there are many others.

These same races attribute all sorts of virtues to the internal organs and fat. The specimen shot on its eggs near Colombo

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mr. Jausz told me had all its fat carefully collected for use in cuts and abrasions, sprains, etc. Colonel Dawson tells me that in Travancore the fat is used locally for sprains, fractures, bruises and rheumatism, and internally for leprosy. In Burma the gall bladder is prized, and its contents used medicinally.

Breeding (a) season.—From what is known of the period of gestation, and the season when eggs are deposited, the mating season is in December, January and February, the coldest months of the year when we know that the python, at any rate in Northen India, is hibernating. We have already seen the effect on the vitality of the snake during this period, which is reduced to the extent that the body heat is sensibly diminished, and the capability for digestion lost. Under the circumstances it is most remarkable that the inclination for sexual indulgence is retained, and yet this conclusion is in perfect agreement with that observed by me in other snakes that hibernate. One must assume that pythons retire in pairs, and that the female is gravid when the term of hibernation is spent. In Paris in 1841 the pair that mated were observed "in copula" several times during the month of January and February and eggs were deposited in May, *i.e.*, the season when eggs are laid in India.

Period of gestation.—From the foregoing it will be seen that the period from mating to the deposition of eggs is about 3 or 4 months.

Our Indian python is oviparous* and lays from 8 to 100 eggs, 107 being the largest brood I have any knowledge of. These are discharged in the hot months, March, April, May and June. The eggs are usually described as being the size of goose eggs, but the only accurate measurement I have been able to procure is from the Director of the Berlin Aquarium who tells me they are 12 c. m. × 6 c. m. ($4\frac{3}{4}$ × $2\frac{7}{8}$ inches), no doubt they vary somewhat. They are white in colour, soft, and equally domed at the poles.

After deposition the female coils herself around them, and has been observed so in captivity, and in a state of nature. As far as

*The African species *regius* is viviparous.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I am aware she appears to be generally alone during this period, I have only once heard of her mate being seen anywhere near her, and I have several records of pythons found lying up with eggs in jungle and being killed, and with one exception no mention has been made of another snake being found close at hand. The eggs are laid sometimes more or less in the open, the dam proving rather a conspicuous object to the shikari. Sometimes the female retires into a hole in a tree, beneath a fallen tree or in a termite's nest, one in the latter situation having been found near Colombo some years ago. Several interesting observations have been made during the period of incubation. The dam's temperature during the event, which happened in Regent's Park in 1881, was recorded several times, and compared with that of a male in an adjoining cage. It was always rather higher being about 1°-4 to 3° Fahrenheit in excess of the male.* In this case the female having once settled herself around the egg remained there for six weeks without taking food, only leaving the eggs once for a few hours. In Paris too in 1841 it was reported that the dam refused food and drink during the whole period which lasted 58 days. When the young were hatching she drank about two tumblers of water. Her task accomplished it was noted that she took little or no notice of the young brood.

Period of incubation.—Though several pythons have laid eggs in captivity, in various Institutions, the eggs have frequently been sterile, or when fertile for some cause have failed to hatch. In Paris however in 1841 the incubation was brought to a successful conclusion, the period being 58 days. The 15 eggs were laid on the 6th of May, and on the 3rd of July eight hatchlings emerged out of the nine fertile eggs. (Günther, Rept. Brit. Ind., p. 330. I have seen it stated elsewhere on the authority of Dumeril that one hatched on the 3rd July, and eight more during the next four days.)

* P. Z. S. 1881, p. 960.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Young.—The hatchlings referred to already, acquired in Travancore, measured on an average 2 feet 5 inches.* In Regent's Park in 1881, the eggs which had been incubated for six weeks were found to be decomposing, and the contained embryos were then 11 inches long. The young hatched in Paris in 1841 are reported to have sloughed in from 10 to 14 days, prior to which they refused all food.

Growth.—The Travancore brood, it is reported, grew 11 inches in 4 months, and it would appear from this that growth in early life is more rapid than later, for Colonel Pollock† states that a specimen he had that was 12 feet long when he got it, grew about 3 feet in 2 years. The smallest incubating or gravid female with which I am acquainted was 11 feet long. This was shot on her eggs in April 1903 near Colombo, and I measured the skin which was in the possession of a Eurasian lad, an enthusiastic collector and lover of snakes. It is difficult to say precisely at what age this length would be attained, but I estimate that the snake would be beginning its sixth year. I find that most snakes double their length in the first year of life, so that a specimen 2½ feet when hatched would be 5 feet at the end of the first year. If one allows a growth of 3 feet for 2 years, the rate given above by Colonel Pollock, 11 feet, would be attained at the end of the 5th year of life. A specimen in Regent's Park was 12 feet long when her eggs were laid. After maturity considerable growth continues for some years in most cases, but in captivity some examples grow little if at all after acquiring a length of 12 feet or less. Thus a specimen captive in Travancore for 12 years 9 months measured but 9½ feet when it died.§

Age.—Very few records seem to have been made of this interesting matter. Gunther however mentions a python attaining the age of 19 years in Regent's Park. It was 4 years old when acquired, and lived a further period of 15 years in captivity. The various breeding events known to me are tabulated as fol-

---

* *The Field*, 3rd October 1903.

† Sporting days in Southern India, p. 223.

§ *The Field*, 16th March 1904.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lows, but I have been most unfortunate in failing to get details of many events I applied for to the various Institutions concerned.

Year and locality.	No. of Eggs.	Month observed.	Length of dam.	Remarks and Authority.
Paris 1841	15	May	?	Observed "in copula" several times in January and February. Eggs deposited 6th May, 9 hatched, 8 on 3rd July (Günther, p. 330).
Regent'sPark 1881	about 20	June	about 12′	Eggs deposited 5th and 6th June. On July 18th embryos 11 inches long (P. Z. S. 1881, p. 960).
Madras 1901	8	..	..	My informant Dr. J. R. Henderson.
Colombo 1903	60	April	11′	Found in termite's nest. I examined the skin.
Trivandrum 1903	40	..	15′	Found in jungle. Eggs hatched, the young averaging 2 ft. 5 inches. (*The Field*, 3rd October 1903).
Balrampur, U. Provinces.	107	Hot season	?	Two found at close quarters, ♂ and ♀ both caged. Eggs hatched. (My informant Mr. M. H. Oakes, D.S P.)
Manchester 1904	53 or 54	April	14′-2″	Dam obtained from Calcutta. Eggs laid 5th April, non-fertile. (*The Field* 30th April 1904, and 11th June 1904.)
U. Provinces 1906	50 to 100	March	18′-3″	Found in jungle on 7th March. (My informant Mr. Prince, K.S.L. Infantry. I saw and measured the skin).
Terai.	?	May	?	Found in open jungle. (My informant Mr. Campbell, Commissioner, U. P).

Sloughing—Many observations have been made in various quarters on this function, which appears to depend upon the general state of health and vital activities of the snake. I have already remarked upon the great reduction in temperature observed by Phipson in a python in our Society's rooms, during the period of hibernation, and with the vitality reduced to such

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a low ebb that the snake was incapable of digesting its food, it is not surprising that there was a coincident abeyance in the disquamative process during this period. Specimens in Madras, and Travancore disquamated during the whole year, and appear not to have hibernated. In India the python sloughs five or six times annually as will be seen from the following table of records :—

Year of Observation.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	July.	Authority.
1886-87.	..	..	27	..	17	..	27	..	..	..	..	..	..	10	..	..	..	Phipson, Journal Bom. N. H. S. II, p. 166.
1895-96.	..	26	..	..	..	18	..	..	..	19	..	..	..	..	..	..	..	Report, Madras Mus. 1896-97.
1896-97.	..	12	..	..	2	..	..	..	..	17	..	..	..	..	..	..	..	Do.
1897-98.	..	6	..	..	..	12	..	..	21	..	..	6	..	..	..	..	..	Do.
1900-01.	..	..	..	..	..	22	..	..	28	..	..	..	4	..	29	..	..	Trivandrum. Col. Dawson in epistola.
1900-01.	..	30	..	..	26	..	..	..	..	..	..	..	..	..	..	..	..	Do.
1901-02.	..	..	..	..	..	..	..	..	*	..	3	..	1	..	22	..	10	Do.
1901-02.	..	..	..	..	..	..	..	8	..	2	..	..	21	..	23	..	6	Do.
1902-03.	..	..	..	..	..	22	..	9	..	17	..	6	..	1	..	2	..	Do.
1902-03.	..	..	..	..	..	..	14	..	..	26	..	19	..	8	..	9	..	Do.
1902-03.	..	..	..	..	..	20	..	15	..	..	13	..	16	..	13	..	..	Do.
1909-10.	19	..	12	..	3	..	24	..	..	..	..	..	2	..	30	..	..	Millard, in epistola

* Date uncertain.

Parasites.—The python like most of its kind harbours many parasites, among which are :—

(1) A cestode or tapeworm (*Bothridium pythonis*) which may be found in great numbers in the intestine (duodenum), either free or attached to the mucous membrane. Professor Shipley found these in a specimen taken at Neligatta, Ceylon.*

* Spol : Zeylanica, Vol. 1, page 49.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(2) A cestode (*Solenophorus megacephalus*). Von Linstow † found this parasite once in the intestine of a tiger killed in the United Provinces, which proved that the carnivore had recently devoured a python.

(3) A nematode or round worm (*Ascaris attenuata*) which inhabits the intestine. These were found by Von Linstow ‡ in a python from the United Provinces.

(4) A nematode referred dubiously by Professor Shipley ¶ to *Ascaris rubicunda*. This was found in the left lung of a Ceylon python.

(5) A linguatulid (*Poocephalus moniliformis*) also found by Shipley § in the lung of a Ceylon python.

(6) Captain Patton, I.M.S., tells me that in Southern India he has frequently found the python infested with ticks (*Aponomma geryasi*) which fix themselves to the skin between the scales.

In addition to the entozoa and ectozoa above referred to, this snake harbours—

(7) A blood parasite (*Hæmogregarina pococki*) discovered by Sambon inhabiting the red blood cells.‖ The intestinal parasites may become a serious detriment to the health of their host, and even cost the snake its life as shown by Ferguson.** He says at one time all the pythons in one cage in the Trivandrum Gardens, Travancore, died, and showed on *post-mortem* examination that they were infested with round worms which in many instances had perforated the walls of the stomach and intestines.

Fables.—I have already under nomenclature referred to the Grecian fable of its antochthonous origin.

Dr. Percival in his book on Ceylon (p. 303) says that the python is reputed by the Singhalese to vanquish tigers, buffaloes and even elephants, and it may be this fable that originated the name "anaconda," which, as stated under nomenclature, appears to be a Ceylon word.

---

† Ind. Mus. Records, Vol. II, Pt. 1, page 108.
‡ Loc. cit. p. 109.
¶ Loc. cit.
§ Loc. cit.
‖ P. Z. S., 1907, p. 283.
** Bombay N. H. Jourl. Vol. X, p. 69.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Tennent * tells me that the Singhalese say that when it has devoured a meal of uncomfortable proportions, it will drag itself through two closely adjacent trees with the object of crushing the contained mass. I put this down as a myth, because a great distension is in itself prone to tax the abdomen to its bursting power, and under such circumstances trifling mechanical agencies would still further jeopardise the integrity of the tissues.

Dr. Davy † says that the Singhalese believe that the "pimbera" when young was a tic polonga (Russell's viper) and had poisonous fangs, but at a certain age it loses these, acquires spurs (rudimentary limbs), and is then metamorphosed into a python. They suppose further that the "spurs" are poisonous, and it uses them in striking its prey. Another belief is that the dam twists her abdomen during parturition, and the males have then to seek and mate with female noyas, as though there were no other females of their own kind with which to mate! Noyas I take to be nagas or cobras. Such a belief seems curious in face of the fact which must be known to them, one would suppose, that the female incubates her eggs. Colonel Dawson tells me that in Travancore the natives believe so in the efficacy of the fat of the python as a healing agent, that they affirm that if a snake is cut in pieces, the application of the fat to the raw parts effects an immediate reunion of them.

Distribution.—Ceylon, Peninsula India from Cape Comorin to the Himalayas, Assam, Burma, but though apparently not inhabiting Indo-China re-appears in South China, the Malay Peninsula and Java.

Its exact limits in North-West India are uncertain, but Murray records it from Sind (Joongshai, Jerruck) and the Punjab. Many of our members should be able to give us information as to whether it occurs in Kashmir. It seems probable that the Indus demarcates its limits in this part of India.

Whilst occurring plentifully in Burma, it is not known from the Andaman-Nicobar Insular group. As regards the Malayan Penin-

---

* Nat. Hist. of Ceylon, p. 304.

† An Account of the Interior of Ceylon, p. 82.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

sula and Java further evidence of a confirmatory nature seems desirable, since Flower (Jourl. As. Soc. Bengal 1899, p. 655) reminds us of what is very true, *viz.*, that *molurus* is found in localities outside its natural range, often being carried thence by itinerant Indian jugglers. He records seeing one in Bankok which enquiry elicited had come with a conjurer from India. Pythons too are accidentally transported in ships occasionally to regions far removed from their natural haunts. It is far commoner I think in the plains than in the hills, but ascends to altitudes up to about 6,000 feet in the Himalayas, and other Indian ranges.

Lepidosis.—*Rostral* much broader than high; in contact with 6 shields, the sutures made with the internasal decidedly shortest; impressed with two elongate furrows or pits parallel to and just below the superior borders.

Internasals.—A pair, the suture between them two-thirds to three-fourths that between the præfrontal fellows. *Præfrontals* a pair, separated from the frontal by a transverse series of small scales.* *Frontal*—Divided longitudinally, as large or rather smaller than the præfrontals. *Supraoculars.*—Rather shorter than the frontal, rather broader than each frontal half. *Parietals.*—None, the frontal being succeeded by small scales. *Nasals.*—In contact with 1st and 2nd labials. *Loreal region* occupied by many scales. Eye surrounded by many scales hardly deserving the name of præoculars, postoculars, etc.

Supralabials 10 to 13, the anterior 2 deeply pitted as shown in our Plate. Sometimes one (usually the 6th) touches the eye. *Infralabials* 18 to 22. Usually some of the anterior and posterior are indented with small roundish depressions, but those may be entirely absent. *Sublinguals* absent, the mental groove being bordered by 5 or 6 small scales. *Costals* two heads-lengths behind heads 54 to 56; in midbody 61 to 75; two heads-lengths before vent 43 to 45. On the back the scales are longer than broad, but in the flanks they enlarge till in the last 2 rows the breadth exceeds the length. The last row is just one-half the breadth of

* This is a curious departure from the usual colubrine arrangement of head shielding but is also seen in the snake *Zamenis diadema.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the ventrals. *Ventrals*—242 to 269, narrow, occupying about the middle third of the belly. *Anal*—Entire, as broad as the ventrals; *Subcaudals* 60 to 72 in pairs. Russell had a specimen which he figures (Pl. XXXIX, Vol. I.) in which 36 pairs were succeeded by 28 entire shields, and these by 3 more pairs.

Dentition.—*Præmaxillary* 4 small teeth, a pair on each side widely separated in the median line. *Maxillary* 18 to 19. The 2nd to 6th or 8th longest, subequal, the rest gradually decreasing in length. All more or less obliquely set with points directed inwards, the posterior almost transverse. *Palatine* 6, first 4 subequal, and as long as maxillary, last 2 progressively decreasing. All strongly inclined inwards. *Pterygoid* 8 to 10, about as large as the posterior maxillary, strongly inclined inwards. *Mandibular* 16 to 19, the 2nd to 6th or 8th longest and subequal, the subsequent teeth progressively diminishing. Strongly inclined inwards, the posterior being almost transverse.

Our Plate is in every way excellent, Mr. Green having in this surpassed all his previous good work.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A MONOGRAPH OF THE WASPS OF THE GENUS *CERCERIS* INHABITING BRITISH INDIA.

WITH NOTES ON OTHER ASIATIC SPECIES

BY

ROWLAND E. TURNER, F.Z.S., F.E.S.

So much collecting has been done in India, and so many new species described since the publication of Colonel Bingham's volume on Aculeate Hymenoptera in 1897, that I think a further revision of some of the genera may be useful. In few genera has the list of Indian species been more increased than in *Cerceris*, owing to the extensive collections made by Colonel Nurse and Mr. Comber near the Baluchistan Frontier. The result, owing chiefly to the Quetta collection, is the inclusion of a number of Palæarctic species in the fauna of British India, the mountainous regions of the North-West Frontier being really part of the Palæarctic region. From a study of Colonel Nurse's collection it seems to me that the Palæarctic species of *Cerceris* have reached Quetta by two routes, firstly through Europe and Turkestan, and secondly from North Africa by way of Southern Arabia and Baluchistan. To the first line belong *C. emarginata*, Panz., and *C. funerea*, Costa; to the second *C. pulchella*, Klug., and *C. pruinosa*, Morice. Few of the species, if any, seem to be identical with those from S. W. Persia. At Karachi on the other hand the species are mainly Indian, or in a few cases representative of, but not identical with, Palæarctic species; many species are common to Karachi and Deesa, and doubtless belong to the fauna of the Rajputana region. As Bingham had very little material from N. W. India, the number of species of *Cerceris* given in his work (24), is almost trebled in the present paper.

I have thought it best to give short descriptions of all the species known to me, as much too little space is given to details of structure in Bingham's work, and Cameron's descriptions are very scattered and not convenient for reference, and also very uneven in quality. Colour seems to be an especially plastic

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

character in this genus. In series of insects showing peculiar local colouration, species of *Cerceris* are included. In hot desert regions the usual black ground colour tends to disappear either through the extension of pale yellow markings or by the substitution of a pale ferruginous colour. This is the case to a great extent in the neighbourhood of Karachi and to a lesser degree at Quetta; the same character also appears in Egypt and Turkestan. In the wet regions of Assam and Burma the black ground colour is retained, but the usual yellow markings are replaced in a number of species by a dull brick red. In the Shillong district species of *Cerceris*, *Crabro*, *Odynerus*, *Eumenes*, *Cœlioxys* and a saw-fly which I have not been able to identify were all influenced in this manner. In Tibet at a high elevation the usual yellow markings tend to be replaced by creamy white, *Cerceris*, *Odynerus*, and an allied species of saw-fly being again affected. In Australia also the prevalent orange colour is shown in the same genera, with the exception of the saw-fly, and also in other genera of *Eumenidæ*, more rarely in species of *Sphecoidea* of other genera. But in all countries the extent of the colour in *Cerceris* is subject to much local variation, and any key to the species in which colour is used extensively must be unsatisfactory. I have therefore based my key on that given by Schletterer for the Palæarctic species of the group, in which structural characters are used as the basis, and have also thought it well to add several plates, which will explain the shape of the clypeus and pygidial area in different species better than can be done in words.

My thanks are due to Colonel Nurse, Mr. Comber and Mr. O. S. Wickwar for the supply of specimens for this paper. I have also been able to make use of the Rothney collection, now in the Oxford museum, containing many of Cameron's types, through the kindness of Professor Poulton; and also the National Collection at South Kensington, which contains Smith's and Bingham's types. Mr. Bainbrigge Fletcher has also sent the collection of the genus from the Pusa collection to me for examination.

I have not described species from the male sex, considering that as a rule it is inadvisable in this genus to make the male the type of a new species. In my key to the males it should be remembered

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

that in some species the sculpture of the enclosed area at the base of the median segment is subject to considerable variation.

Key to the Indian species of *Cerceris*.

FEMALES.

1.	♀♀. Cheeks with a stout spine	2
	Cheeks without a spine	4
2.	Clypeus flat; pygidial area much narrowed to the apex; the spine on the cheeks very long and stout	*C. inexorabilis* Turn.
	Clypeus not flat; pygidial area only slightly narrowed to the apex; the spine on the cheeks short or of moderate length	3
3.	Clypeus slightly concave: the spine on the cheeks moderately long	*C. ephippium* Turn.
	Clypeus slightly convex; the spine on the cheeks short	*C. fletcheri* Turn.
4.	Sides of ventral segments 3-5 with erect plates; fifth ventral segment recurved at the apex, with a triangular tooth in the middle ..	*C. mastogaster* Sm
	Ventral segments without lateral erect plates; fifth ventral segment not recurved and without a median tooth	5
5.	Fifth ventral segment produced at each of the apical angles into a stout, blunt tooth ..	*C. funerea* Costa, var *pallidopicta* Rad.
	Fifth ventral segment not produced into a tooth at the angles	6
6.	Second ventral segment with a raised area at the base	7
	Second ventral segment without a raised area at the base	30
7.	Clypeus with a free lamina springing from the base	*C. violaceipennis* Cam.
	Clypeus without a free lamina or with the extreme apical margin only free	8
8.	Mesopleuræ tuberculate or spinose	9
	Mesopleuræ without tubercles	12
9.	Mesopleuræ with two well defined tubercles ..	10
	Mesopleuræ with only one well defined tubercle.	11

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

10.	The two tubercles on the mesopleuræ close together, another very indistinct above the intermediate coxæ	*C. dentata* Cam.
	The tubercles far apart, the one above the intermediate coxæ acute and bent forward ..	*C. quettaensis* Cam.
11.	Clypeus convex, with a narrow triangular truncation from below the middle to the apex	*C. pulchella* Klug.
	Clypeus flattened, the apical half subconcave ..	*C. spectabilis* Rad.
12.	Clypeus truncate at the apex	13
	Clypeus more or less emarginate at the apex ..	23
13.	Lamina of the clypeus free at the apex ..	*C. melaina* Turn.
	Clypeus without a free lamina at the apex ..	14
14.	Clypeus subconcave from the base	15
	Clypeus not subconcave at the base	16
15.	Clypeus with a strongly impressed transverse line before the apex	*C. comberi* Turn.
	Clypeus without an impressed line	*C. albopicta* Sm.
16.	Clypeus slightly convex, not impressed on the apical half, with a minute tooth on each side at the apex	*C. boysi* Turn.
	Clypeus impressed on the apical half or above, the apex not toothed	17
17.	Enclosed area at the base of the median segment longitudinally striated from base to apex	*C. fortinata* Cam.
	Enclosed area otherwise sculptured	18
18.	Clypeus narrowed towards the apex, the truncated margin not measuring more than half the length of the clypeus	*C. novaræ* Sauss.
	The truncated margin of the clypeus measuring much more than half the length of the clypeus	19
19.	Second ventral segment rather sparsely but evenly punctured, not smooth in the middle on the apical portion	20
	Second ventral segment smooth in the middle on the apical portion	21
20.	Petiole broader than long, not narrowed at the apex	*C. protea* Turn.
	Petiole as long as broad, narrowed at the apex.	*C. compta* Turn.
21.	Clypeus impressed from above the middle to the apex; petiole much broader than long ..	*C. rybiensis* Linn.
	Clypeus not impressed above the middle; petiole not much, if at all broader than wide.	22

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

22.	Apical half of clypeus distinctly concave; enclosed area of median segment finely punctured, with oblique striæ in the corners...	*C. wickwari* Turn.
	Apical half of clypeus flat, not concave; enclosed area of median segment longitudinally striated on the basal half	*C. emarginata* Panz.
23.	Lamina of the clypeus slightly porrect and free at the extreme apex	24
	Lamina of the clypeus not porrect or free at the apex	28
24.	Basal area of the median segment very coarsely longitudinally striated	*C. vischnu* Cam.
	Basal area of the median segment not striated..	25
25.	The emargination of the clypeus wide and shallow, not angular	26
	The emargination of the clypeus angular ..	27
26.	Basal area of the median segment sparsely punctured; pygidial area elongate ovate, as narrow at the base as at the apex	*C. tristis* Cam.
	Basal area of the median segment smooth, striated on the margins; pygidial area much broader at the base than at the apex ..	*C. opulenta* Turn.
27.	Abdomen as coarsely punctured as the thorax..	*C. belli* Turn.
	Abdomen less coarsely punctured than the thorax	*C. pulchra* Cam.
28.	Basal area of median segment smooth and shining; clypeus very widely and shallowly emarginate on the whole breadth, the angles produced	*C. pruinosa* Morice
	Basal area of median segment striated; the emargination of the clypeus not extending over the whole breadth	29
29.	The emargination of the clypeus rather wide, produced into an obtuse tooth on each side..	*C. instabilis* Sm.
	The emargination of the clypeus reduced to a narrow incision with a tooth on each side ..	*C. abuensis* Turn.
30.	Clypeus with the lamina more or less free ..	31
	Clypeus without a free lamina	42
31.	The lamina of the clypeus free from the base..	32
	The lamina free only from the middle or below.	38
32.	Mesopleuræ tuberculate	33
	Mesopleuræ not tuberculate	34

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

33.	Lamina much broadened from the base, very widely and deeply emarginate..	*C. orientalis* Sm.
	Lamina not broadened from the base, shallowly emarginate	*C. saussurei* Rad. var. *chrysothemis* Turn.
34.	Enclosed area at the base of median segment smooth and shining	35
	Enclosed area longitudinally rugose or striated	37
35.	Enclosed area of the median segment with a deep median groove; pygidial area much broader at the base than at the apex ..	*C. agnata* Turn.
	Enclosed area with the median groove almost obsolete ; pygidial area much broader at the apex than at the base	36
36.	Lamina of clypeus widened from the base, broader at apex than long, shallowly emarginate	*C. humbertiana* Sauss.
	Lamina truncate at apex, no broader than long, not widened from the base	*C. flavopicta* Sm.
37.	Lamina broadly incised almost to the base; enclosed area of the median segment longitudinally rugose	*C. acuta* Rad.
	Lamina shallowly and widely emarginate ; enclosed area longitudinally striated	*C. hilaris* Sm.
38.	Lamina free from the middle or slightly below; mesopleuræ not tuberculate	39
	Lamina free at the apex only ; mesopleuræ tuberculate	*C. elizabethæ* Bingh.
39.	Clypeus below the lamina more or less dentate at the apex	40
	Clypeus below the lamina truncate at the apex, the lamina truncate	*C. flavoplagiata* Cam.
40.	The lamina in the form of a thickened porrect tubercle, feebly incised at the apex	*C. pentadonta* Cam.
	The lamina of the usual flattened form ..	41
41.	Lamina truncate ; two teeth on each side on apical margin of clypeus	*C. latibalteata* Cam.
	Lamina slightly emarginate ; three teeth at apex of clypeus	*C. specifica* Turn.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

42.	Clypeus with several teeth on the apical margin	43
	Clypeus without teeth on the apical margin ..	46
43.	The teeth four or five in number, well defined, not very small	44
	The four teeth almost obsolete, very minute ..	*C. rothneyi* Cam.
44.	First abdominal segment about twice as long as broad	*C. kirbyi* Bingh.
	First abdominal segment nearly twice as broad as long	45
45.	Closely punctured; the clypeus narrowed to the apex	*C. downesivora* Turn.
	Less closely punctured; clypeus not narrowed at the apex	*C. tetradonta* Cam.
46.	Clypeus widely and deeply emarginate ..	47
	Clypeus not at all or only very shallowly emarginate	49
47.	Mesopleuræ tuberculate; enclosed area of the median segment finely and closely punctured.	*C. nebulosa* Cam.
	Mesopleuræ not tuberculate; enclosed area not punctured	48
48.	Enclosed area of median segment longitudinally striated	*C. binghami* Turn.
	Enclosed area smooth and shining	*C. wroughtoni* Cam.
49.	Clypeus strongly convex	50
	Clypeus very feebly convex or flat	51
50.	Clypeus produced into a beak-like prominence just before the apex	*C. rhyncophora* Turn.
	Clypeus with a margined groove from near the middle widening slightly to the apex ..	*C. fastidiosa* Turn.
51.	Mesopleuræ distinctly tuberculate	52
	Mesopleuræ not at all or very indistinctly tuberculate	53
52.	Apical margins of the clypeus recurved and narrowly produced in the middle	*C. vigilans* Sm.
	Apical margin of the clypeus truncate ..	*C. baluchistanensis* Cam.
53.	Clypeus truncate at the apex	54
	Clypeus very shallowly emarginate at the apex	56

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

54. Enclosed area of the median segment longitudinally striated .. .. *C. leucozonica* Schlett.

Enclosed area of the median segment not striated on the whole surface 55

55. Enclosed area of the median segment smooth and shining .. .. *C. nursei* Turn.

Enclosed area of the median segment striated at the base, punctured at the apex .. .. *C. circumcincta* Turn.

56. Enclosed area of the median segment smooth and shining; mesopleuræ very indistinctly tuberculate .. .. *C. mellicula* Turn.

Enclosed area of the median segment shining, with large scattered punctures; mesopleuræ not tuberculate .. .. *C. bolanica* Turn.

♂♂. MALES.

1. Second ventral segment with a raised area at the base 2

Second ventral segments without a raised area at the base 18

2. Sixth ventral segment with a small tooth on each side at the apical angles.. .. .. *C. abuensis* Turn.

Sixth ventral segment without a tooth .. 3

3. Mesopleuræ distinctly tuberculate .. .. *C. quettænsis* Cam.

Mesopleuræ not tuberculate 4

4. Clypeus broadly rounded at the apex 5

Clypeus truncate at the apex 8

5. Clypeus with four minute teeth at the apex .. *C. instabilis* Sm.

Clypeus without teeth 6

6. Enclosed area of the median segment coarsely longitudinally striated.. .. .. .. *C. vischnu* Cam.

Enclosed area of the median segment smooth or punctured 7

7. Enclosed area of the median segment rather sparsely punctured .. .. *C. pulchra* Cam.

Enclosed area of the median segment smooth and shining, with a few striæ at the apex .. *C. novarae* Sauss.

8. Second ventral segment evenly punctured, except on the raised basal area .. .. *C. albopicta* Sm.

Second ventral segment not evenly punctured, usually smooth in the middle 9

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

9.	Enclosed area of the median segment more or less striated	10
	Enclosed area of the median segment not striated	13
10.	Enclosed area striated in the angles only, or with very short striæ on the sides	11
	Enclosed area striated beyond the angles ..	12
11.	Enclosed area striated in the angles, punctured in the middle and at the apex; petiole black; punctures not very deep	*C. emarginata* Panz.
	Enclosed area striated in the angles and with very short striæ at the sides, the middle smooth and shining; petiole red; punctures very deep	*C. wickwari* Turn.
12.	Enclosed area entirely longitudinally striated; puncturation of the abdomen coarse and close.	*C. fortinata* Cam.
	Enclosed area not striated at apex; puncturation less coarse and close	*C. rybiensis* Linn.
13.	Enclosed area of the median segments smooth and shining	14
	Enclosed area of the median segment punctured	16
14.	First abdominal segment red, almost twice as long as broad	*C. comberi* Turn.
	First abdominal segment black and yellow, only a little longer than broad	15
15.	Basal area of the second ventral segment very strongly raised; the wings infuscated on the whole apical margin	*C. pulchella* Klug.
	Basal area of second ventral segment not strongly raised; wings clouded at the apex only	*C. spectabilis* Rad.
16.	Enclosed area of the median segment very finely and closely punctured	*C. violaceipennis* Cam.
	Enclosed area not finely or closely punctured.	17
17.	Enclosed area shining, sparsely and not coarsely punctured; petiole longer than broad ..	*C. tristis* Cam.
	Enclosed area coarsely punctured, petiole broader than long	*C. protea* Turn.
18.	Sixth ventral segment with a long spine at the apical angles	19
	Sixth ventral segment without spines	20

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

19.	Fifth ventral segment with a spine at the apical angles	*C. hilaris* Sm. (*himalayensis* Bingh.)
	Fifth ventral segment without spines	*C. mellicula* Turn.
20.	Petiole slender, more than three times as long as broad	21
	Petiole never more than twice as long as broad	22
21.	Median segment strongly punctured	*C. basimacula* Cam.
	Median segment finely and sparsely punctured.	*C. lepcha* Cam
22.	Clypeus armed with a row of teeth at the apex.	23
	Clypeus without teeth	26
23.	Petiole longer than broad; the teeth of the clypeus minute	*C. wroughtoni* Cam.
	Petiole broader than long..	24
24.	Apical joints of the flagellum longer than the penultimate, and strongly curved, abdomen mostly ferruginous	*C. vigilans* Sm.
	Apical joint of the flagellum no longer than the penultimate ; abdomen black and yellow, rarely ferruginous on the petiole	25
25.	Enclosed area of the median segment shining, with a median grove, more or less obscurely punctured ; teeth of the clypeus very small..	*C. rhyncophora* Turn.
	Enclosed area of the median segment smooth and shining, without a median grove ; teeth of the clypeus not very small	*C. humbertiana* Sauss.
26.	Mesopleuræ tuberculate	27
	Mesopleuræ not tuberculate	28
27.	Petiole longer than broad	*C. bimaculata* Cam.
	Petiole broader than long	*C. nebulosa* Cam
28.	Clypeus strongly concave	*C. nursei* Turn.
	Clypeus not concave	29
29.	Apical joint of the flagellum longer than the penultimate and strongly curved	30
	Apical joint of the flagellum no longer than the penultimate, less strongly curved	33

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

30.	Penultimate joint of the antennæ strongly split and hollowed beneath for the reception of the apical joint	*C. ephippium* Turn.
	Structure of the penultimate joint of the flagellum normal	31
31.	Enclosed area of the median segment sparsely punctured..	*C. baluchistanensis* Cam.
	Enclosed area of the median segment smooth..	32
32.	Wings flavo-hyaline; ground colour of thorax ferruginous	*C. orientalis* Sm.
	Wings hyaline; ground colour of thorax black..	*C. saussurei* Rad. var. *chrysothemis* Turn.
33.	Petiole as long as broad or longer	34
	Petiole broader than long..	36
34.	Enclosed area of the median segment smooth and shining	*C. rothneyi* Cam.
	Enclosed area punctured or rugulose	35
35.	Clypeus rounded at apex; enclosed area rugulose; almost entirely yellow	*C. sulphurea* Cam.
	Clypeus truncate; enclosed area punctured; black, banded with yellow	*C. bolanica* Turn.
36.	Abdomen finely and rather shallowly punctured; clypeus truncate	*C. circumcincta* Turn.
	Abdomen coarsely and deeply punctured; clypeus not truncate	37
37.	Clypeus bisinuate at apex	*C. tetradonta* Cam.
	Clypeus rounded at apex..	*C. flavopicta* Sm.

Cerceris violaceipennis Cam.

Cerceris violaceipennis Cam. Ann. and Mag. Nat. Hist. (7) xiii, p. 292, 1904. ♂.

Cerceris rufoplagiata Cam. Ann. and Mag. Nat. Hist. (7) xv, p. 221, 1905. ♂.

♀. Nigra, opaca; clypeo, margine interiore oculorum, carina frontali, scopo, flagello basi, pronoto, tegulis, scutello, post-scutello, segmento abdominali primo apice, secundo basi, tertio fascia apicali, tibiis tarsisque ferrugineis; alis subhyalinis, costa obscuriore, stigmate testaceo, clypeo lamina porrecta, subquadrata; mesopleuris, haud tuberculatis; segmento mediano area basali oblique striata, apice punctata; segmento ventrali secundo area basali elevata, area pygidiali late ovata.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♂. Feminæ similis ; clypeo albopiloso ; apice late truncato, minutissime tridentato, nigro, macula basali fulvo-ferruginea.

Long. ♀, 12 mm. ; ♂, 8 mm.

♀. Clypeus with the lamina porrect, free from the base, nearly as long as broad, convex and truncate at the apex. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus ; the second joint of the flagellum nearly half as long as again as the third. Eyes almost parallel ; posterior ocelli further from the eyes than from each other. Mesopleuræ not tuberculate ; first abdominal segment nearly as long as broad ; second ventral segment with a raised area at the base ; pygidial area broadly ovate, narrow at the base, broadly truncate at the apex, less than half as long again as broad. Finely punctured rugulose, the median segment and mesopleuræ rugose ; enclosed area at the base of the median segment finely obliquely striated at the base, finely punctured at the apex. First recurrent nervure received a little before the middle of the second cubital cell.

♂. As in the female ; but the clypeus is convex, truncate at the apex, with three very minute teeth on the apical margin. First abdominal segment about one-quarter longer than the greatest breadth. Pygidial area not much longer than broad, slightly narrowed at the extremities. Closely and finely punctured.

Habitat—Khasi Hills. 6,000 ft. August.

I took both sexes at Shillong ; the female not having been described previously. It is remarkable in having the raised area at the base of the second ventral segment together with the free lamina on the clypeus of the female.

Cerceris orientalis Sm.

Cerceris orientalis Sm. Cat. Hym. B. M. IV, p. 454, 1856. ♀ ♂.

♀. Sordide ferruginea ; mandibulis apice, maculaque supra antennas nigris ; alis flavo-hyalinis, apice infumatis ; clypeo lamina porrecta, lata, apice semicirculariter emarginata ; mesopleuris tuberculatis ; segmento mediano area basali nitida ; segmento ventrali secundo area basali elevata nulla.

♂. Feminæ similis, clypeo et fronte flavis ; clypeo latitudine sesqui longiore, apice truncato, ante apicem longitudinaliter impresso.

Long. ♀, 18-23 mm. ; ♂, 17-18 mm.

Variat ♂ macula post oculos, pronoto, segmentisque abdominalibus 3—6 flavis.

♀. Clypeus with a porrect lamina from the base, the lamina nearly twice as broad at the apex as long, broadened to the apex and deeply and widely emarginate, depressed beneath the lamina and widely emarginate at the apex Antennæ inserted low down on the front, nearly three times

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as far from the anterior ocellus as from the base of the clypeus, second joint of the flagellum half as long again as the third. Head large, the cheeks broader than the greatest breadth of the eyes. Pygidial area half as broad again at the base as at the apex, gradually narrowed, truncate at the apex, about twice as long as the greatest breadth. First recurrent nervure received at the middle of the second cubital cell. Closely but not coarsely punctured.

♂. Clypeus half as long again as broad, truncate at the apex, a depressed longitudinal groove from near the middle to the apex. Apical joint of the flagellum strongly curved, longer than the penultimate; antennæ inserted less than twice as far from the anterior ocellus as from the base of the clypeus. Pygidial area truncate at the apex, slightly narrow from base, less than twice as long as the greatest breadth.

Habitat—Bengal; Madras; Central Provinces; Deesa.

Cerceris saussurei Rad.

Cerceris saussurei Rad. Fedtschenko: Turkestan Sphegid, p. 60, 1877, ♂ var. *chrysothemis* var. n.

♀. Ferruginea, clypeo, fronte, et abdomine segmentis 3-5 flavis; alis subhyalinis, apice infuscatis; clypeo lamina libera, longitudine duplo latiore, apice emarginata, mesopleuris bituberculatis; segmento mediano area basali nitida.

Long. 19 mm.

♂. Flavus; vertice, mesothorace, area basali segmenti mediani, segmentisque abdominalibus 3-6 basi nigris; antennis, segmento mediano, abdominis segmento primo, secundoque basi ferrugineis; clypeo latitudine fere duplo longiore, apice truncato.

Long. 15 mm.

♀. Clypeus with a free lamina from the base, the lamina short, twice as broad as long, widely and shallowly emarginate at the apex; the apical margin of the clypeus below the lamina widely emarginate and clothed with long hairs. Antennæ inserted fully twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum nearly as long as the first and third combined. Posterior ocelli further from the eyes than from each other; cheeks a little broader than the greatest breadth of the eyes. Pronotum strongly depressed in the middle, rounded at the angles. Mesopleuræ armed with two small tubercles. First abdominal segment nearly twice as broad as long, slightly constricted at the apex, second ventral segment without a raised area at the base. Pygidial area elongate ovate, twice as long as the greatest breadth, rounded at the apex. Rather sparsely punctured, closely and coarsely on the median segment and mesopleuræ; very sparsely on the apical segments of the abdomen; the enclosed space at the base of the median

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

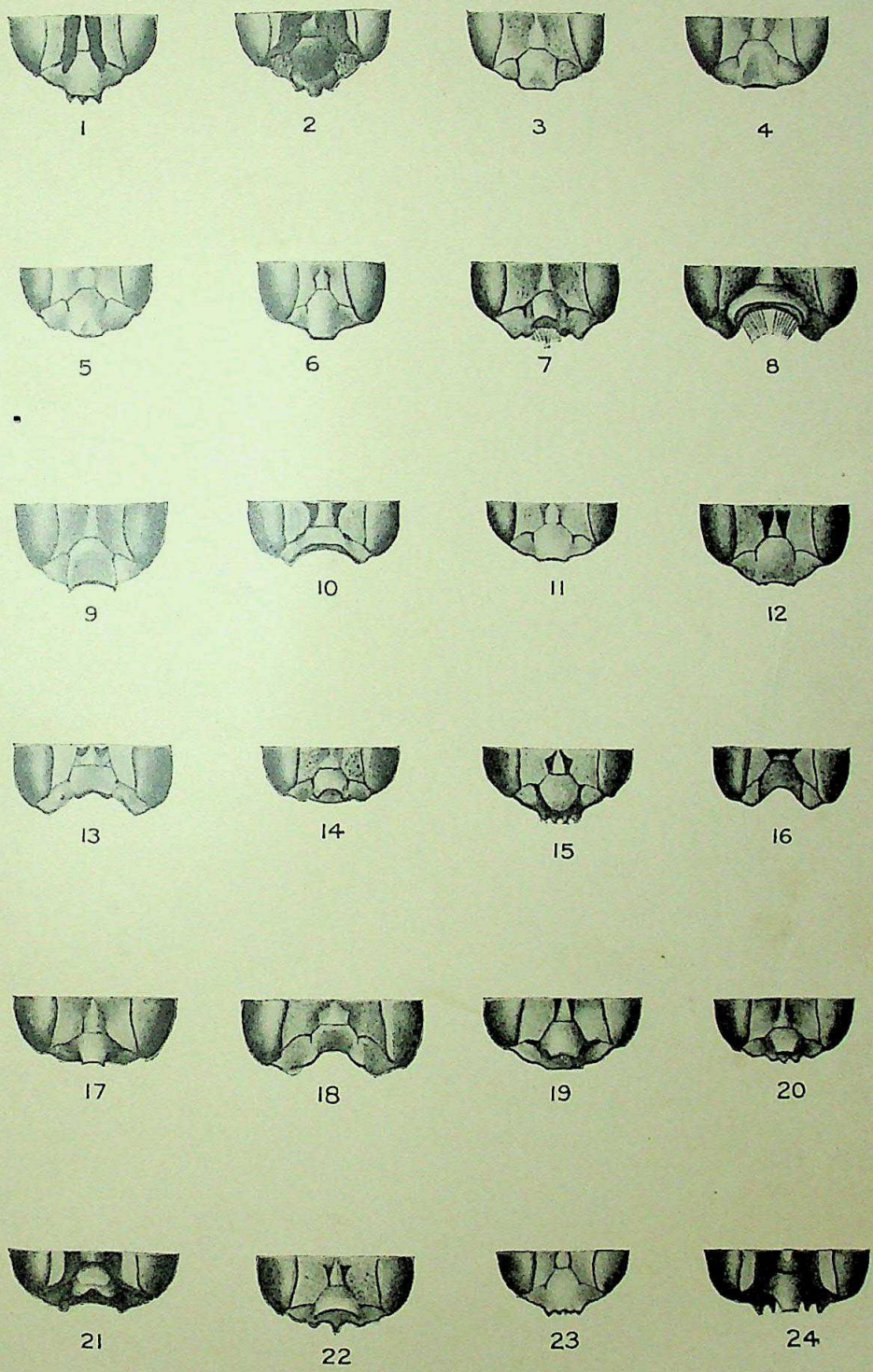
MONOGRAPH OF THE WASPS OF BRITISH INDIA.

EXPLANATION OF PLATE A.

1.	*Cerceris vigilans*, Sm. ♂.	Front of head.
2.	" " " ♀.	" "
3.	*Cerceris funerea*, Costa var. *pallidopicta*, Rad. ♀.	" "
4.	*Cerceris quettaensis*, Cam. ♀.	" "
5.	*Cerceris pulchella*, Klug. ♀.	" "
6.	*Cerceris saussurei*, Rad. var. *chrysothemis*, Turn. ♂.	" "
7.	" " " " " " ♀.	" "
8.	*Cerceris orientalis*, Sm. ♀.	" "
9.	*Cerceris pruinosa*, Morice. ♀	" "
10.	*Cerceris wroughtoni*, Cam. ♀.	" "
11.	*Cerceris leucozonica*, Schlett. ♀.	" "
12.	*Cerceris rothneyi*, Cam. ♀.	" "
13.	*Cerceris binghami*, Turn. ♀.	" "
14.	*Cerceris inexorabilis*, Turn. ♀.	" "
15.	*Cerceris tetradonta*, Cam. ♀.	" "
16.	*Cerceris nebulosa*, Cam. ♀.	" "
17.	*Cerceris agnata*, Turn. ♀.	" "
18.	*Cerceris ephippium*, Turn. ♀.	" "
19.	*Cerceris flavoplagiata*, Cam. ♀.	" "
20.	*Cerceris flavopicta*, Sm. ♀.	" "
21.	*Cerceris hilaris*, Sm. ♀.	" "
22.	*Cerceris humbertiana*, Sauss. var. *viscosus*, Sm. ♀.	" "
23.	*Cerceris kirbyi*, Bingh. ♀.	" "
24.	*Cerceris latibalteata*, Cam. ♀.	" "

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Catherine A. M. Pearce.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

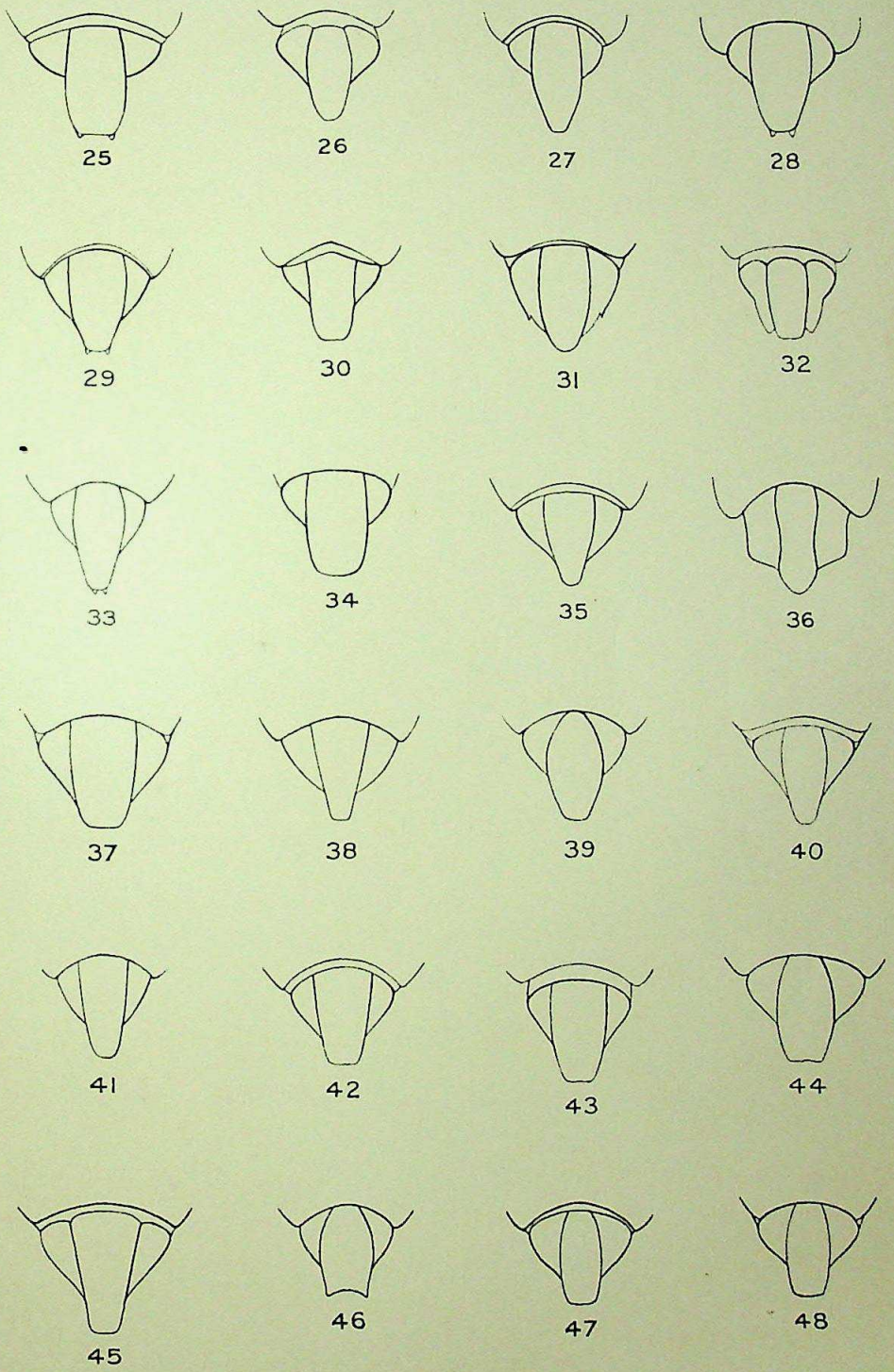
Digitized by Arya Samaj Foundation Chennai and eGangotri

Explanation of Plate B.

25.	*Cerceris vigilans*, Sm. ♂.	Pygidial area.
26.	" " " ♀.	" "
27.	*Cerceris funerea*, Costa var. *pallidopicta*, Rad. ♀.	" "
28.	*Cerceris quettensis*, Cam. ♀.	" "
29.	*Cerceris pulchella*, Klug. ♀.	" "
30.	*Cerceris saussurei*, Rad. var. *chrysothemis*, Turn. ♂.	" "
31.	" " " " " " ♀.	" "
32.	*Cerceris orientalis*, Sm. ♀.	" "
33.	*Cerceris pruinosa*, Morice. ♀.	" "
34.	*Cerceris wroughtoni*, Cam. ♀.	" "
35.	*Cerceris leucozonica*, Schlett. ♀.	" "
36.	*Cerceris rothneyi*, Cam. ♀.	" "
37.	*Cerceris binghami*, Turn. ♀.	" "
38.	*Cerceris inexorabilis*, Turn. ♀.	" "
39.	*Cerceris tetradonta*, Cam. ♀.	" "
40.	*Cerceris nebulosa*, Cam. ♀.	" "
41.	*Cerceris agnata*, Turn. ♀.	" "
42.	*Cerceris ephippium*, Turn. ♀.	" "
43.	*Cerceris flavoplagiata*, Cam. ♀.	" "
44.	*Cerceris flavopicta*, Sm. ♀.	" "
45.	*Cerceris hilaris*, Sm. ♀.	" "
46.	*Cerceris humbertiana*, Sauss. var. *viscosus*, Sm. ♀.	" "
47.	*Cerceris kirbyi*, Bingh. ♀.	" "
48.	*Cerceris latibalteata*, Cam. ♀.	" "

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Catherine A. M Pearce.

INDIAN FOSSORIAL WASPS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

segment smooth and shining, the median groove indistinct. First recurrent nervure received at the middle of the second cubital cell.

Ferruginous; clypeus, front and abdominal segments 3-5 bright yellow. Wings hyaline, tinged with yellow, a small fuscous cloud at the apex; nervures ferruginous.

♂. Clypeus nearly twice as long as broad, narrowly truncate at the apex. Antennæ inserted twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum longer than the third, the apical joint distinctly curved and truncate at the apex. Posterior ocelli as far from each other as from the eyes. First abdominal segment twice as broad as long; pygidial area with parallel sides, about half as long again as broad. Head and thorax coarsely and closely punctured, sparsely on the scutellum; the triangular space at the base of the median segment smooth and shining, with a distinct median furrow; the abdomen deeply but not very closely punctured. Yellow; the vertex, prothorax, enclosed area at the base of the median segment and the base of abdominal segments 3-6 black; antennæ, median segment, first abdominal segment and the base of the second segment ferruginous. Legs ferruginous variegated with yellow. Wings as in the female.

Habitat.—Quetta (Nurse). June and July.

I am not sure that I am correct in my identification of this species, the original description being of the male only, and not mentioning details of structure. The male from Quetta differs from the typical form in having much of the ferruginous colour replaced by yellow, but otherwise agrees well with the figure. The type was taken in the deserts of the Sir Daria.

Cerceris acuta Rad.

Cerceris acuta Rad. Fedtschenko Reise, Turkestan, p. 54, 1877. ♀.

♀. Nigra; mandibulis, apice excepto, clypeo, margine interiore oculorum late, carina frontali, scapo, macula post oculos, vertice fascia curvata, pronoto, mesopleuris maculis duabus, scutello, postscutello, segmento mediano maculis magnis lateralibus, segmento dorsali secundo basi, tertio, quarto, quintoque fascia emarginata apicali, segmento ventrali secundo tertioque, coxisque flavis; flagello, tegulis, abdomine pedibusque ferrugineis; alis subhyalinis, apice infuscatis; venis fuscis, stigmate testaceo; clypeo lamina libera porrecta, bilobata; mesopleuris haud tuberculatis; segmento ventrali secundo area basali elevata nulla, segmento mediano area basali longitudinaliter rugoso.

Long. 13 mm.

♀. Lamina of the clypeus free from the base, porrect, broader than long, very deeply incised; the apical margin below the lamina produced into a point. Antennæ inserted more than twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

half as long again as the first. Posterior ocelli nearly half as far again from the eyes as from each other. Pygidial area ovate, almost pointed at the base, rather broadly truncate at the apex; first abdominal segment as long as broad. First recurrent nervure received close to the middle of the second cubital cell. Closely but not very deeply punctured, sparsely and shallowly on the abdomen, the enclosed area at the base of the median segment longitudinally rugose.

Habitat.—Kangra Valley, 4,500 ft. (*Dudgeon*).

This differs considerably in colour from the typical form. The clypeus, however, corresponds well with Radosskowski's figure, and I have little doubt that it is identical, though the original description is too insufficient for certainty.

Cerceris hilaris Sm.

Cerceris hilaris Sm., Cat. Hym. B. M. IV., p. 452, 1856. ♀.

Cerceris himalayensis Bingh. Journ. Bombay Nat. Hist. Soc. XII, p. 120, 1898, ♂. (nec Cameron, 1905).

Cerceris simlaensis Cam. Entomologist, p. 83, 1905, ♂.

♀. Nigra, clypeo in medio, margine interiore oculorum, macula post oculos, pronoto in medio interrupto, scutello macula utrinque, postscutello, segmento mediano fascia longitudinali utrinque, segmento dorsali primo apice late, segmentis 2-5 fascia angusta apicali flavis; antennis basi, segmento abdominali secundo, pedibusque rufo-testaceis; alis subhyalinis, apice infuscatis; clypeo lamina libera, porrecta, longitudine latiore, apice late emarginata; mesopleuris haud tuberculatis, segmento mediano area basali longitudinaliter striata; segmento ventrali secundo area elevata basali nulla.

♂. Niger; clypeo, fronte, macula post oculos, pronoto utrinque, tegulis, postscutello, segmento mediano angulis basalibus flavo-lineato, segmentis abdominalibus 1-6 fascia angusta apicali, pedibusque flavis; flagello basi testaceo; clypeo latitudine longiore, margine apicali truncato, in medio valde impresso, segmentis ventralibus 5-6 apice utrinque spino longo armatis.

Long. ♀, 14 mm.; ♂, 10-11 mm.

♀. Lamina of the clypeus porrect and free, broadened from the base, twice as broad at the apex as long, and widely emarginate. Antennæ inserted twice as far from the anterior ocellus as from the base of the clypeus, second joint of the flagellum half as long again as the third. Eyes almost parallel, the posterior ocelli further from the eyes than from each other. First abdominal segment more than half as broad again as long; second ventral segment without a raised area at the base; pygidial area narrowed from the base, twice as broad at the base as at the apex, twice as long as the greatest breadth, truncate at the apex. Fifth ventral

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

segment depressed in the middle on the apical margin. Shallowly punctured, the enclosed space at the base of the median segment longitudinally striated.

♂. Clypeus smooth and shining, longer than broad, truncate at the apex, deeply impressed on the middle of the apical margin, with a minute tooth on each side. Apical joint of the flagellum strongly curved, scarcely longer than the penultimate. Fifth and sixth ventral segments with a long spine on each side at the apical angles, the spines of the sixth segment blunt at the apex. Pygidial area large nearly as broad at the apex as long, broadened to the base, truncate at the apex. Enclosed area at the base of the median segment longitudinally striated.

Habitat—Simla (*Nurse*), ♂; N. India (*Smith*), ♀.

I think I am right in treating these as sexes of one species. Bingham includes *hilaris* ♂ in his description of the female, but mentions no differences. He also gives Madras as a locality, but I do not know on what authority. I have seen the type of *simlaensis*, Cam.

Cerceris humbertiana Sauss.

Cerceris humbertiana Sauss, Reise D. Novara Zool. II.

? *Cerceris emortualis* Sauss, Reise D. Novara Zool. II.

♀. Nigra; primo segmento abdominali rufo-ferrugineo; clypeo, fronte, pronoto, tegulis, mesopleuris macula, scutello fascia interrupta, postscutello, segmento mediano fascia longitudinali utrinque, segmentis 2-4 fascia lata emarginata vel interrupta, segmento quinto, segmentis ventralibus pedibusque flavi; alis hyalinis, apice valde infumatis; clypeo lamina porrecta, longitudine vix latiore, apice leviter emarginata; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla; area pygidiali apice emarginata.

♂. Feminæ similis; segmento primo abdominali nigro; clypeo apice rotundato, tridentato.

Long. ♀, 10 mm.; ♂, 9 mm.

♀. Clypeus with the lamina porrect from the base, scarcely broader at the base than long, slightly widened to the apex and very feebly emarginate. Antennæ inserted more than twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum about one-quarter longer than the third. Eyes almost parallel, posterior ocelli half as far again from the eyes as from each other. Mesopleuræ not tuberculate; first abdominal segment more than twice as broad as long; second ventral segment without a raised area at the base; pygidial area rugulose almost pointed at the base, widened rather sharply near the base, the sides on the apical half very slightly converging, the apical margin broad and very shallowly emarginate, the area less than twice as long as the greatest breadth. Coarsely punctured; the enclosed area at the base of the median

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

segment smooth and shining, the median groove very indistinct. First recurrent nervure received beyond one-third from the base of the second cubital cell.

♂. Clypeus much longer than broad, rounded at the apex and armed with three small teeth. Apical joint of flagellum shorter than the penultimate and only feebly curved; antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus. Pygidial area twice as along as broad, truncate at the apex, the sides parallel.

Habitat—Colombo, Ceylon (*Wickwar*).

I have not seen specimens, answering to the description of *emortualis*, but am inclined to treat it as a variety as Saussure suggests. The ground colour of *humbertiana* varies considerably, the black tending to be more or less replaced by ferruginous which is the normal ground colour in *viscosus*, Sm. Bingham treats *viscosus* as a synonym of *humbertiana* but the lamina of the clypeus is much boarder and more distinctly emarginate. I consider that *flavopicta*, Sm. is probably a local race differing in the shallow puncturation, and the much smaller lamina of the clypeus. But for the present it is better to keep this form distinct. I have only seen *flavopicta* from West and North-West India, *viscosus* from Bengal and *humbertiana* from Ceylon. Bingham, however, gives Assam and other localities in N.-E. India for *flavopicta*, but possibly his specimens may have been incorrectly identified. The locality Barrackpore for *flavopicta* is not confirmed by any specimen now in the Rothney collection.

Cerceris humbertiana Sauss. subsp. *viscosus* Sm.

Cerceris viscosus Sm. Trans. Ent. Soc. London, p. 40, 1875, ♀.

Cercerus rufinodis Sm. Trans. Ent. Soc. London, p. 41, 1875, ♂.

♂. Differs from typical *humbertiana* in the shape of the lamina of the clypeus, which is about half as broad again at the base as long. The usual ground colour is ferruginous.

♂. This sex does not differ appreciably from typical *humbertiana*. The ground colour is usually black with a red petiole.

Habitat—Bengal.

Cerceris flavopicta Sm.

Cerceris flavopicta Sm. Cat. Hym. B. M. IV., p. 451, 1856, ♀ ♂.

Cerceris sulphurea Bingh. Fauna Brit. India Hymen. I., p. 305, 1897, ♀ ♂ (nec Cameron).

♀ Nigra; antennis anoque rufo-testaceis; clypeo, fronte, scapo, genis, pronoto, tegulis, scutello, postscutello, mesopleuris, segmento mediano macula magna utrinque, segmentis dorsalibus 1-4 macula magna utrinque, quinto facia lata, pedibusque flavis; alis hyalinis, apice infuscatis; clypeo lamina libera, porrecta, apice truncata; mesopleuris haud dentatis;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

segmento mediano area basali nitida ; segmento ventrali secundo area basali elevata nulla ; area pygidiali apice late truncata.

♂. Feminæ similis ; segmentis abdominalibus fasciis latis flavis ; clypeo convexo, apice late rotundato.

♀. Very nearly allied to *C. humbertiana* Sauss. ; but the lamina of the clypeus is short, as long as the breadth at the apex, slightly broader at the base than at the apex ; the apical margin of the clypeus is distinctly bisinuate but not tridentate as in *humbertiana* ; the first abdominal segment is a little narrower, being rather less than twice as broad as long ; the pygidial area is a little less widened to the apex, which is truncate ; and the punctures are somewhat finer and shallower.

The clypeus of the male is without teeth at the apex.

Habitat—Bombay (Coll. Rothney) ; N. India (British Museum).

The label has been accidentally shifted, or placed on the wrong specimen originally, in the Rothney collection, which has misled Bingham. The true *sulphurea* Cam., is a male and is marked *flavopicta* in the Rothney collection. This may possibly be the specimen referred to by Bingham as *sulphurea* ♂, but it is so totally distinct from the female described by him that I can hardly think he would have placed them together. The specimen of *flavopicta* in the Rothney collection is from Bombay, and is more finely and sparsely punctured than the typical form from N. W. India.

Cerceris agnata sp. n.

♀. Nigra ; thorace dense, abdomine sparse punctato ; segmento mediano area basali nitida ; clypeo, fronte, macula post oculos, vertice fascia transversa interrupta, pronoto, tegulis, mesopleuris macula, scutello, postscutello, segmento mediano macula magna utrinque, segmento dorsali secundo basi, tertio macula basali nigra, quarto quintoque fascia apicali, segmentis ventralibus 2-5 flavis ; antennis pedibusque, posterioribus nigro-variegatis, testaceis ; ano rufo ; clypeo lamina libera, mesopleuris haud tuberculatis, segmento ventrali secundo area basali elevata nulla ; alis hyalinis, apice infumatis.

Long. 9 mm.

♀. Clypeus with a free lamina, which is half as broad again as long and truncate at the apex. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum half as long again as the third. Posterior ocelli a little further from the eyes than from each other ; the eyes diverging slightly towards the clypeus. Mesopleuræ without tubercles ; first abdominal segments longer than broad ; second ventral segment without a raised area at the base ; pygidial area narrowly rounded at the apex twice as wide at the base as at the apex, gradually narrowed, twice as long as the greatest breadth. Head and thorax closely but not coarsely

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

punctured ; the enclosed area at the base of the median segment smooth and shining, with a deep median groove ; abdomen more sparsely and finely punctured. First recurrent nervure received at one quarter from the base of the second cubital cell.

Habitat—Thaung-yin Valley, Tenassarim (*Bingham*). June 1891.

In colour this closely resembles *C. kirbyi* Bingh. but the clypeus is quite different and the thorax is much more coarsely punctured.

Cerceris flavoplagiata Cam.

Cerceris flavoplagiata Cam. Entomologist, p. 16, 1905, ♀.

♀. Nigra ; capite, mesonoto, scutello, antennisque rufo-ferrugineis ; clypeo, fronte, genis, vertice maculis duabus utrinque, pronoto, mesopleuris maculis duabus, scutello macula utrinque, segmento mediano macula magna, utrinque, segmento abdominali dorsali secundo basi late, ventrali toto, segmentis 2-5 apice fascia angusta flavis ; pedibus rufo flavoque variegatis ; alis subhyalinis, apice infuscatis, venis testaceis ; clypeo lamina apicali libera, porrecta, apice truncata ; mesopleuris haud tuberculatis ; segmento ventrali secundo area basali elevata nulla ; segmento mediano area basali delicatissime punctata.

Long. 15 mm.

♀. Clypeus with the lamina free, springing from below the middle and truncate at the apex. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum nearly half as long again as the first. Eyes distinctly diverging towards the clypeus, the posterior ocelli quite half as far again from the eyes as from each other. Mesopleuræ without tubercles ; first abdominal segment longer than broad, second ventral segment without a raised area at the base ; pygidial area rugose, truncate at the apex, twice as long as broad, the sides almost parallel. Finely and shallowly punctured, more coarsely on the vertex ; the enclosed space at the base of the median segment very finely and closely punctured, without a distinct median groove. First recurrent nervure received just before the middle of the second cubital cell.

Habitat—Himalayas.

Cerceris pentadonta Cam.

Cerceris pentadonta Cam. Mem. Manchester Lit. Phil. Soc. (4) III., p. 262, 1890, ♀.

♀. Nigra ; mandibulis, margine interiore oculorum, carina frontali, pronoto, tegulis, postscutello, segmento dorsali tertio toto, quintoque dimidio apicali fulvo ferrugineis ; alis fusco-hyalinis, apice magis infuscatis; clypeo in medio tuberculato, porrecto, tuberculo apice inciso, margine apicali utrinque bidentato ; mesopleuris haud tuberculatis ; segmento

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

mediano area basali punctata, in angulis oblique striata ; segmento ventrali secundo area basali elevata nulla.

Long. 8 mm.

♀. Clypeus with a short, stout, porrect tubercle in the middle, the tubercle notched at the apex ; the apical margin of the clypeus below the tubercle armed with two sharp teeth on each side and a very minute one in the middle. Antennæ inserted low down, more than twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum very little longer than the third. Eyes parallel ; posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles ; first abdominal segment nearly twice as long as broad ; second ventral segment without a raised area at the base; pygidial area fully twice as long as broad, almost pointed at the base and rather narrowly truncate at the apex. Closely but not deeply punctured, more coarsely on the abdomen than on the thorax ; enclosed area at the base of the median segment very finely and closely punctured, finely striated in the angles and on the sides. First recurrent nervure received beyond one third from the base of the second cubital cell.

Habitat—Barrackpore (*Rothney*).

This is near *C. latibalteata* Cam. from which it differs in the form of the lamina of the clypeus and in the greater length of the first abdominal segment. It is also more closely punctured.

Cerceris specifica sp. n.

♀. Nigra ; clypeo, fronte, scapo, linea pone oculos, vertice linea transversa, pronoto, mesonoto macula quadrata, tegulis, scutello, postscutello, mesopleuris maculis duabus, segmento mediano utrinque, segmentoque secundo dorsali basi flavis ; flagello subtus, segmentis abdominalibus 1-3 apice late, 4-5 apice anguste, pedibusque partim fulva-ferrugineis ; alis hyalinis, apice infumatis ; clypeo lamina ante apicem libera, porrecta, apice leviter emarginata, margine apicali sub lamina obtuse tridentato ; mesopleuris haud tuberculatis ; segmento mediano area basali nitida ; segmento ventrali secundo area basali elevata nulla.

Long.

♀. Clypeus with the lamina porrect from the middle, shallowly emarginate at the apex ; the apical margin below the lamina with three blunt teeth, rather narrow. Antennæ inserted less than half as far again from the anterior ocellus as from the base of the clypeus, second joint of the flagellum nearly half as long again as the third. Eyes parallel, the posterior ocelli further from the eyes than from each other. First abdominal segment longer than broad, widest in the middle ; second ventral segment without a raised area at the base ; pygidial area elongate ovate, truncate at the apex and a little wider than at the base, more than twice as long as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the greatest breadth. Closely and rather finely punctured; the enclosed area at the base of the median segment smooth and shining, with a shallow median groove. First recurrent nervure received just before one-third from the base of the second cubital cell.

Habitat—Kandy, Ceylon (*Wickwar*). June.

This is quite distinct from *humbertiana*, Sauss., the lamina of the clypeus being free from the middle only, and not from the base; and the first abdominal segment being slender.

A male closely resembling *C. lepcha* Cam. sent by Mr. Wickwar from Haputale, Ceylon, probably belongs to this species.

Cerceris latibalteata Cam.

Cerceris latibalteata Cam. Ann. and Mag. Nat. Hist. (7) XIII., p. 292 1904, ♀.

? *Cerceris lepcha* Cam. Ann. and Mag. Nat. Hist. (7) XV, p. 222, 1905, ♂.

♀. Nigra; mandibulis, carina frontali, margine interiore oculorum, pronoto, scutello, postscutello, segmento dorsali tertio, segmento, quinto apice, tarsisque anterioribus fulvo-ferrugineis; alis fusco-hyalinis, apice obscurioribus; clypeo convexo, lamina ante apicem libera, truncata, margine apicali sub lamina utrinque bidentato; mesopleuris haud dentatis; segmento mediano area basali subnitida, in angulis striata; segmento ventrali secundo area basali elevata nulla.

Long. 8 mm.

♀. Clypeus convex, the lamina free from a little below the middle and porrect, truncate at the apex, the apical margin of the clypeus below the lamina armed with two well defined teeth on each side. Antennæ inserted twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum about one-quarter longer than the third. Eyes parallel; the posterior ocelli half as far again from the eyes as from each other. Pronotum not depressed in the middle, rounded at the angles; mesopleuræ without tubercles: first abdominal segment broadest in the middle, as long as the greatest breadth; second ventral segment without a raised area at the base; pygidial area elongate ovate, as broad at the apex as at the base, about two and a half times as long as the greatest breadth, narrowly truncate at the apex. Finely punctured, more coarsely on the abdomen than elsewhere; the median segment slightly shining and rather sparsely punctured, the enclosed area at the base minutely punctured, finely striated in the angles, with a shallow median groove. First recurrent nervure received beyond one-third from the apex of the second cubital cell.

Habitat—Khasi Hills (Coll. Rothney).

This species is very near *pentadonta* Cam. but differs as noticed under that species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I consider that *C. lepcha* Cam. will probably prove to be male, but do not think the evidence is sufficient to place them together. If my surmise is correct, it is probable that *basimacula* Cam. which is nearly allied to *lepcha*, would be the male of *pentadonta*.

Cerceris lepcha Cam.

Cerceris lepcha Cam. Ann. and Mag. Nat. Hist. (7) XV, p. 222, 1905, ♂.

♂. Niger; clypeo, margine interiore oculorum, segmento mediano macula apicali utrinque, segmento abdominali secundo basi, trochanteribusque pallide flavis; pronoto utrinque, tegulis, scutello macula utrinque, postscutello, segmentisque dorsalibus tertio quintoque fere totis flavo-ochraceis; alis subhyalinis, apice leviter infumatis; clypeo apice truncato: mesopleuris haud tuberculatis; segmento mediano area basali subnitida, minutissime punctata; segmento abdominali primo latitudine triplo longiore; segmento ventrali secundo area basali elavata nulla.

Long. 7 mm.

♂. Clypeus nearly as broad as long, truncate at the apex. First abdominal segment very slender, three times as long as broad; pygidial area twice as broad at the base as at the apex. Rather finely and sparsely punctured, more closely and coarsely on the abdomen than on the thorax or median segment.

Habitat—Khasi Hills, 5,000 ft. April (*Turner*).

As mentioned above, I think this will prove to be the male *latibalteata* Cam.

Cerceris basimacula Cam.

Cerceri basimacula Cam. Ann. and Mag. Nat. Hist. (7) XX, p. 87, 1907, ♂.

♂. "Black; a mark on the centre of the clypeus (obliquely narrowed above and below, a broad line on its apex, a broad line on the inner orbits from the antennæ, two large oblique marks on the apex of the metanotum (extending on to the pleuræ), the basal third of the abdominal petiole on the sides, more than the basal third of the second segment, and narrow lines on the apices of the fourth and fifth segments, yellow; the sides of the central and lower parts of the clypeus, prothorax, scutellums more than the apical third of the second and third abdominal segments, a line behind the yellow on the fourth and fifth, and the apical two segments entirely dark rufous; the apex of the first segment of a paler rufous colour. Four front legs pale rufo-testaceous; the tibiæ and base of tarsi yellow; the hind legs similarly but much darker coloured. Wings hyaline, the radial cellule smoky, the apical cubital cellule of a deeper smoky colour; the costa and stigma dark testaceous, the nervures black. Antennæ rufo-testaceous, the space yellow below, the eight apical joints blackish, paler below ♂.

Length 10 mm.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sikkim.

Face strongly but not closely punctured; the clypeus more finely and closely punctured; there is a short keel in the centre of the latter, with a fovea on either side. Front and vertex strongly, somewhat closely punctured. Middle of pronotum closely punctured, the sides almost smooth; mesonotum somewhat strongly but not closely punctured; the scutellum is more strongly but not so closely punctured as the latter. Postscutellum smooth. Metanotum strongly punctured, the punctures clearly separated; the area shining, smooth. Head and thorax densely covered with white pubescence. First abdominal segment of equal width, about four times as long as wide, longer than the second; the segments strongly punctured; the pygidium strongly but not very closely punctured; the sides rounded, narrowed at the base and apex, the latter slightly rounded inwardly. The whole abdomen covered with longish white pubescence. Hypopygium depressed at the apex; the latter has a slight rounded incision.

Allied to *C. lepcha* Cam."

Cerceris elizabethæ Bingh

Cerceris elizabethæ Bingh. Fauna Brit. India, Hymen I., p. 312, 1897, ♀.

♀. Nigra, rugose punctata, segmento mediano area basali oblique striata; mandibulis basi flavis; segmentis abdominalibus primo toto, secundo basi rufotestaceis; antennis, tibiis tarsisque fusco-ferrugineis; clypeo apice lamina libera truncata; mesopleuris bituberculatis; segmento ventrali secundo area basali elevata nulla; alis hyalinis, apice infumatis, venis testaceis.

Long. 11 mm.

♀. The lamina of the clypeus is porrect at the apex, the apical margin transverse; the clypeus short and broad. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum half as long again as the third posterior ocelli further from the eyes than from each other; the eyes diverging towards the clypeus. Mesopleuræ armed with two acute tubercles; first abdominal segment a little longer than broad; pygidial area more than twice as long as the greatest breadth, narrowed towards the rounded apex. First recurrent nervure received at the middle of the second cubital cell.

Habitat—Thaungyin Valley, Tenasserim (*Bingham*). May.

Cerceris ephippium sp. n.

♀. Nigra, luxuriose flavovariegata, clypeo subconcavo, late emarginato prope angulos acute marginato, genis dente armatis, segmento mediano area basalis oblique striata, area pygidiali apice truncata, segmento ventrali quinto apice crasse elevato.

Long. 13 mm.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mandibles with a strong tooth on the inner margin near the middle; clypeus slightly concave, widely and deeply emarginate at the apex, with, an oblique carina on each side close to the apical angles. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum distinctly longer than the third. Head very broad, the eyes diverging a little towards the clypeus, separated on the front by a distance equal to about three times the length of the scape. Cheeks very broad, exceeding the greatest breadth of the eye, and armed with a stout acute tooth. Posterior ocelli more than half as far again from the eyes as from each other. Head, thorax and abdomen closely but not deeply punctured, more shallowly on the abdomen than elsewhere. Pronotum shallowly depressed in the middle; mesopleuræ armed with two small spines before the intermediate coxæ. Enclosed area at the base of the median segment obliquely striated, divided by a shallow median groove. First abdominal segment nearly twice as broad as long, the second segment only half as broad again as the first, without a raised area at the base on the ventral surface. Fifth ventral segment not margined or raised, without spines at the angles. Pygidial area twice as long as the greatest breadth, gradually narrowed and truncate at the apex, nearly twice as broad at the base as at the apex. First recurrent nervure received at the middle of the second cubital cell.

Lemon yellow; front and vertex black; an oblique spot on each side on the vertex, the front below the base of the antennæ, produced upwards in three parallel bands, the middle one reaching the anterior ocellus yellow; mesonotum black, with a yellow longitudinal band on each side near the middle and a spot above the tegulæ; the enclosed area at the base of the median segment black with two small yellow spots; a broad line extending to the apex of the median segment, the base of all the dorsal abdominal segments narrowly, and a line on the middle of segments 1-4 black. Flagellum and pygidial area testaceous brown. Wings hyaline, fuscous at the extreme apex.

Habitat—Karachi (*Comber*), September and October; Deesa (*Nurse*); S. Othman, Arabia (*Nurse*). March.

Near *C. Komarowii* Rad. but in that species there are two tubercles near the middle of the clypeus, and the shape of the pygidial area is different.

♂ Similar to the female, but the clypeus is strongly convex, half as long again as the greatest breadth and truncate at the apex. Antennæ inserted half as far again from the anterior ocellus as from the base of the clypeus. Cheeks without spines. Pygidial area more than half as long again as broad, the sides parallel. The apical joint of the flagellum is strongly curved. This species has probably reached the desert portion

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of N. W. India from Arabia, which may be found to be the home of other Karachi species also.

Cerceris inexorabilis sp. n.

♀. Flava, capite mesonotoque nigris flavovariegatis; clypeo plano, emarginato, prope angulos acute carinato, genis dente maximo armatis; segmento mediano area basali nitida.

Long. 13 mm.

Clypeus short, flat, emarginate at the apex, with an acute oblique carina on each side near the apical angles. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum almost as long as the first and third combined; the carina between the antennæ rather low, triangularly truncate at the apex. Head broad; the eyes diverging towards the clypeus, separated on the front by more than two and a half times the length of the scape; cheeks very broad, nearly half as broad again as the greatest breadth of the eye, armed with a very long stout spine. The whole insect closely, but not very deeply punctured; the enclosed area at the base of the median segment smooth and shining, divided by a longitudinal furrow. Pronotum strongly depressed in the middle, subtuberculate on each side; mesopleuræ with two very small spines in front of the intermediate coxæ. First abdominal segment short, nearly twice as broad as long; second ventral segment without a raised area at the base; fifth ventral segment not raised on the margin; pygidial area granulate, gradually narrowed from the base, truncate narrowly at the apex, about three times as broad at the base as at the apex. First recurrent nervure received near the middle of the second cubital cell.

Dull lemon yellow; front, vertex and mesonotum black; the front below base of the antennæ, produced upwards in three parallel bands, the middle one reaching the anterior ocellus yellow; two oblique yellow bands on the vertex; two yellow longitudinal bands on each side of the mesonotum; pygidial area fuscous. Wings hyaline, clouded at the apex, stigma testaceous.

Habitat—Karachi (*Comber*).

This may possibly be *C. seravensis* Rad. but in the description of that insect there is no mention of the large spine on the cheeks, which could hardly have been overlooked. The present species is very near the last, (*ephippium*), but the clypeus is narrower, especially on the apical margin, the sculpture of the area at the base of the median segment is quite different, the pygidial area is narrower at the apex, and the pronotum is subtuberculate.

Cerceris fletcheri sp. n.

♀. Flavo-ochracea; mandibulis apice nigris; alis hyalinis, apice

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

infumatis ; clypeo fere plano, apice late emarginato, angulis subporrecto ; genis dente armatis ; mesopleuris minute bituberculatis ; segmento mediano area basali lævi, opaca ; segmento ventrali secundo area basali elevata nulla.

Long. 9 mm.

♀. Clypeus broader than long, widely emarginate at the apex ; the emargination near the angles furnished with a slightly porrect oblique carina on each side. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus ; the second joint of the flagellum about half as long again as the third. Eyes slightly divergent towards the clypeus ; the posterior ocelli nearly half as far again from the eyes as from each other. Cheeks about as broad as the eyes, armed with a short tooth. Pronotum deeply depressed in the middle, rounded at the angles ; mesopleuræ with two minute tubercles. First abdominal segment twice as broad as long ; second ventral segment without a raised area at the base ; pygidial area broadly rounded at the apex, more than half as broad again at the base as at the apex, gradually narrowed, about twice as long as the greatest breadth. Closely and rather finally punctured ; the enclosed area at the base of the median segment smooth but opaque ; mesopleuræ deeply punctured.

Habitat—Chapra, Bihar (*Mackenzie*).

In the Pusa Collection.

The colour of the only specimen I have seen is reddish, evidently due to discolouration by cyanide ; the colour in life is probably yellow or ochreous. The spine on the cheeks is smaller than in the other two Indian species of the group.

Cerceris sulphurea Cam.

Cerceris sulphurea Cam. Mem. Manchester Lit. Phil. Soc. (4) III., p. 261, 1890, ♂.

♂. Stramineus ; flagello, vertice macula utrinque, mesonoto fasciis tribus longitudinalibus pallide ferrugineis ; alis hyalinis, apice infuscatis ; clypeo longitudine aequilato, apice late rotundato, mesopleuris haud tuberculatis ; segmento mediano area basali punctata segmento abdominali primo latitudine sesqui longiore ; segmento ventrali secundo area basali elevata nulla.

Long. 8 mm.

♂. Clypeus as long as the greatest breadth, broad rounded at the apex. Antennæ inserted almost as far from the base of the clypeus as from the anterior ocellus ; the second joint of the flagellum about one quarter longer than the third ; the apical joint equal in length to the penultimate, and very slightly curved. Eyes slightly divergent towards the clypeus ; posterior ocelli more than half as far again from the eyes as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

from each other. Mesopleuræ without tubercles; first segment of the abdomen about half as long again as broad, second ventral segment without a raised area at the base; pygidial area sparsely punctured, about half as broad again at the base as at the apex, nearly twice as long as the breadth at the apex. First recurrent nervure received at one-fifth from the base of the second cubital cell. Closely and rather deeply punctured, most coarsely on the abdomen; the enclosed space at the base of the median segment punctured, with indistinct oblique striæ at the base.

Habitat—Bombay (Coll. *Rothney*).

As I have pointed out under *C. flavopicta*, Bingham's description of the female *sulphurea* is taken from *flavopicta*. I doubt if his brief notice of the male can be meant for the present species.

Cerceris wroughtoni Cam.

Cerceris wroughtoni Cam. Mem. Manchester Lit. Phil. Soc. (4), III., p. 258, 1890, ♀.

♀. Nigra; clypeo, fronte, genis, scapo, pronoto, scutello, postscutello mesopleuris macula parva, segmento primo dorsali macula utrinque, secundo tertioque dimidio apicali, quarto quinto macula magna mediana flavis; flagello, segmento mediano macula apicali utrinque, pedibusque testaceis; clypeo brevi, late emarginato; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla; alis hyalinis, apice infuscatis.

♂. Feminæ similis; segmento quarto sextoque flavis, quinto nigro; clypeo apice late rotundato, dentibus tribus minutis armato.

Long. ♀ ♂, 11 mm.

♀. Clypeus short and broad, deeply and very widely emarginate at the apex, flattened. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the interantennal carina low; second joint of the flagellum nearly half as long again as the third. Eyes very slightly diverging towards the clypeus; posterior ocelli half as far again from the eyes as from each other. Pronotum not depressed in the middle; mesopleuræ without tubercles; first abdominal segment nearly twice as broad as long; second ventral segment without a raised basal area; pygidial area rugulose, large, truncate at the apex, the sides almost parallel, a little less than twice as long as broad. Head closely and finely, thorax and median segment more sparsely punctured, abdomen and the enclosed space at the base of the median segment smooth. Wings subhyaline, stigma testaceous, a fuscous cloud at the apex. First recurrent nervure received beyond onethird from the base of the second cubital cell.

♂. Clypeus a little longer than the greatest breadth, very broadly rounded at the apex and armed with three minute teeth. First abdominal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

segment longer than broad ; pygidial area coarsely punctured, large, a little less than twice as long as broad, the sides parallel. Thorax and median segment more closely and deeply punctured than in the female ; the enclosed area at the base of the median segment coarsely obliquely striated ; abdomen sparsely punctured.

Habitat—Nasik, W. India (*Comber*). September.

I have not seen the type, but Cameron's description is quite sufficient.

Cerceris binghami sp. n.

Cerceris ferox Bingh. Fauna Brit. India Hym. I, p. 310, 1897, ♀. (nec *ferox* Sm.).

♀. Niger, clypeo, fronte, macula post oculos, pronoto utrinque, postscutello, segmento mediani macula apicali utrinque, segmentis abdominalibus 2-5 fascia angusta apicali, tibiisque anticis et intermediis flavis ; tarsis anticis et intermediis rufotestaceis ; alis fusco-hyalinis ; clypeo brevi, late emarginato, lobis lateralibus tuberculatis ; mesopleuris haud tuberculatis, segmento mediano area basali longitudinaliter striata, segmento ventrali secundo area basali elevata nulla.

Long. 14 mm.

♀. Middle lobe of the clypeus twice as broad as long, flat, the apical margin very widely emarginate, not recurved. Lateral lobes of the clypeus with a small tubercle near the middle. Antennæ inserted low down, more than twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum half as long again as the third. Head broad, the posterior ocelli more than half as far again from the eyes as from each other. Mesopleuræ without tubercles, second ventral segment without an elevated basal area. First abdominal segment as broad as long ; pygidial area large, less than twice as long as broad, truncate at the apex, the sides nearly parallel. Head and thorax coarsely and closely punctured, the mesonotum reticulate, the basal area of the median segment longitudinally striated, without a dividing furrow ; abdomen finely and sparsely punctured, the segments not much constricted. First recurrent nervure received beyond the middle of the second cubital cell.

Habitat—Ataran, Tenasserim (*Bingham*). February.

This was treated by Bingham as a variety of *C. ferox* Sm., differing only in colour. But in *ferox* the middle lobe of the clypeus is porrect, with the lamina free at the apex and very broadly rounded ; the tubercles on the lateral lobes are on the margin, not near the middle ; the first abdominal-segment is much longer than broad, the pygidial area is narrower at the base, gradually narrowed to the apical margin, which is less than half as broad as the base. These distinctions are ample for a specific distinction. Bingham's description of *ferox* seems to be taken from the present species and not from true *ferox*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Cerceris nebulosa Cam.

Cerceris nebulosa Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 265, 1890, ♀.

Cerceris erythropoda Cam. Ann. & Mag. Nat. Hist. (7) X, p. 57, 1902, ♀.

Cerceris himalayensis Cam. Ann. & Mag. Nat. Hist. (7) XV, p, 220, 1905, ♂

Cerceris intimella Cam. Ann. & Mag. Nat. Hist. (7) XV, p. 221, 1905, ♀.

Cerceris assamensis Cam. Entomologist, p. 269, 1905, ♂.

♀. Nigra; clypeo, fronte, macula pone oculos, pronoto, segmento abdominali primo apice, secundo basi, tertioque apice ferrugineis; alis fusco-hyalinis, stigmate testaceo; clypeo lato, apice semicirculariter emarginato; segmento mediano area basali tenuissime punctata; mesopleuris subtuberculatis; segmento ventrali secundo area basali elevata nulla.

♂. Feminæ similis; clypeo convexo, apice producto et leviter inciso.

Long. ♀, 15 mm.; ♂, 10 mm.

♀. Clypeus broad and flat, bent slightly outwards near the apex and very widely and deeply emarginate. Antennæ inserted low down on the front, separated from the base of the clypeus by a distance not exceeding the length of the third joint of the flagellum; the second joint of the flagellum as long as the first and third combined. Eyes diverging towards the clypeus; posterior ocelli half as far again from the eyes as from each other. Pronotum not depressed in the middle; mesopleuræ with two feeble tubercles; first abdominal segment broader than long, strongly constricted at the apex; second ventral segment without a raised area at the base; fifth ventral segment with a narrow longitudinal groove in the middle; pygidial area elongate ovate, twice as long as the greatest breadth, very narrowly truncate at the apex, granulate. Finely and closely punctured, more strongly and sparsely on the abdomen; the median segment rugulose on the apical slope, the enclosed area at the base finely and closely punctured; mesopleuræ striated. First recurrent nervure received just before the middle of the second cubital cell.

♂. Clypeus convex, longer than broad, slightly incised on the middle of the apical margin. Pygidial area a little longer than the breadth at the base, twice as long as the breadth at the apex. Penultimate joint of the flagellum longer than the apical.

Habitat—Khasi Hills, 6,000 ft. June to August.

A fairly common species above Shillong. The extent of the ferruginous colour is very variable. The list of synonyms at the head of this description is an example of the careless descriptions in Cameron's later papers. A female of this species is also labelled in Rothney's

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

collection as the type male of *C. bimaculata*, but does not correspond to the description. A male of another species, marked *C. bimaculata* type, is doubtless the true type.

Cerceris bimaculata, Cam.

Cerceris bimaculata Cam. Ann. & Mag. Nat. Hist. (7) XV, p. 219, 1905, ♂.
Cerceris canaliculata Cam. Ann. & Mag. Nat. Hist. (7) XV, p. 219, 1905, ♂.
Cerceris cameroni Schulz. Spolia Hymenopt. p. 194, 1906.

♂. Niger; clypeo, fronte, pronoto, scutello macula utrinque, segmento dorsali secundo basi, tertio fascia lata apicali, tibiis tarsisque anticis ferrugineis; alis fusco-hyalinis, stigmata testaceo; clypeo convexo, apice truncato; mesopleuris subtuberculatis: segmento abdominali primo fere sesqui longiore; segmento ventrali secundo area basali elevata nulla; segmento mediano area basali punctata.

Long. 9 mm.

♂. Clypeus convex, truncate at the apex, a little longer than the greatest breadth; antennæ inserted at least half as far again from the anterior ocellus as from the base clypeus; second joint of the flagellum nearly half as long again as the third, apical joint scarcely as long as the penultimate and slightly curved. Eyes parallel; the posterior ocelli more than half as far again from the eyes and from each other. Mesopleuræ subtuberculate; first abdominal segment about half as long again as broad; second ventral segment without a raised area at the base; pygidial area nearly twice as long as broad, the sides parallel. Head and thorax, including the enclosed area at the base of the median segment, very finely and closely punctured; abdomen rather more coarsely punctured; mesopleuræ rugose. First recurrent nervure received at onethird from the base of the second cubital cell.

Habitat—Khasi Hills (Coll. *Rothney*.)

This species is distinguished from *nebulosa*, Cam., by the longer petiole. The type of *canaliculata* is without the two fulvo-ferruginous spots on the scutellum, but I cannot see that it differs otherwise, nor does Cameron give any other difference in the unfortunate paper in which both are described. He is capable of far better work, as is shown by his paper on the same genus in the memoirs of the Manchester Society for 1890.

Cerceris mastogaster Sm.

Cerceris mastogaster Sm. Cat. Hym. B. M. IV, p. 453, 1856, ♀.

♀. Nigra; clypeo, scapo subtus, pronoto utrinque, tegulis, postscutello, segmento secundo dorsali fascia transversa basali interrupta, tertio quintoque utrinque, tibiis tarsisque flavis; flagello subtus, segmento mediano (area basali excepta), segmentis abdominalibus 1-4, femoribusque ferrugineis; alis hyalinis, apice infumatis; clypeo lato, truncato, apice dentibus duobus minutis armato; segmento mediano area basali nitido; segmento

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ventrali secundo area basali elevata nulla ; segmentis ventralibus 3-5 lateribus cristatis, quinto margine apicali reflexo, in medio dentato.

Long. 14 mm.

♀. Clypeus more than half as broad again at the apex as the greatest length, the apical margin truncate, with two small teeth close to the middle ; antennæ inserted a little further from the anterior ocellus than from the base of the clypeus ; the second joint of the flagellum nearly as long as the first and third combined ; posterior ocelli a little further from the eyes than from each other. Pronotum not depressed in the middle ; mesopleuræ without tubercles. First abdominal segment as long as broad ; second ventral segment without a raised area at the base ; ventral segments 3-5 with a strong erect process on each side ; the fifth with the apical margin recurved, with a triangular tooth in the middle. Pygidial area elongate ovate, rather narrowly truncate at the apex, more than twice as long as the greatest breadth, the surface granulate. Strongly punctured ; the enclosed area at the base of the median segment smooth and shining, with a few striæ at the base, divided by a shallow longitudinal furrow. First recurrent nervure received before one-quarter from the base of the second cubital cell.

Habitat—Madras (*W. Elliot*).

I have only seen the type. The structure of the ventral abdominal segments is remarkable, and probably is of assistance to the insect in transporting beetles, perhaps *Buprestidæ*.

Cerceris tetradonta Cam.

Cerceris tetradonta Cam. Mem. Manch. Lit. and Phil. Soc. (4) III., p. 261. 1890.

♀. Nigra, punctata ; clypeo, fronte, genis, vertice fascia transversa utrinque, pronoto, tegulis, mesopleuris macula, scutello, postscutello, segmento mediano macula utrinque, segmentis dorsalibus 1—5, ventralibus 2—4, macula transversa utrinque pallide flavis ; segmento primo basi, femoribusque ferrugineis ; pedibus flavovariegatis ; clypeo apice truncato, quadridentato ; mesopleuris tuberculo parvo ; segmento ventrali secundo area basali elevata nulla, segmento mediano area basali nitida.

♂. Clypeus apice bisinuatus ; fasciæ abdominis fere continuæ.

Long. ♀, 9 mm ; ♂, 7 mm.

♀. Clypeus truncate at the apex, with four blunt teeth. Antennæ inserted nearly twice as far from the anterior ocellus as from the base of the clypeus, second joint of the flagellum half as long again as the third. Mesopleuræ with a minute tubercle ; second ventral segment without a raised area at the base ; first segment twice as broad as long ; pygidial area broadest in the middle, almost pointed at the base, truncate at the apex, nearly twice as long as the greatest breadth. Deeply but not very

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

closely punctured, more coarsely on the abdomen than on the thorax, the enclosed space at the base of the median segment smooth and shining, the median groove indistinct. Wings hyaline, with a fuscous cloud at the apex; first recurrent nervure received at one-third from the base of the second cubital cell.

♂. Clypeus very feebly bisinuate at the apex; apical joint of the flagellum feebly curved, shorter than the penultimate; first abdominal segment a little broader than long; pygidial area narrowed from the base to the truncated apex. The yellow bands on the abdomen are only very narrowly interrupted and there is no ferruginous colour at the base of the abdomen either on the dorsal or ventral surface. The flagellum is ferruginous.

Habitat—Western India, from Poona to Karachi; Deesa; Abu (*Nurse*); Karachi (*Comber*).

Cerceris downesivora sp. n.

♀. Nigra; clypeo in medio, fronte, scapo, linea post oculos, pronoto utrinque, tegulis, postocutello, segmento mediano fascia longitudinali utrinque, segmentis 2—5 fascia angusta apicali, tibiis tarsisque anterioribus et intermediis flavis; alis subhyalinis, apice obscuris; clypeo latitudine longiore, apice obtuse quadridentato; mesopleuris haud tuberculatis, segmento ventrali secundo area basali elevata nulla; segmento mediano area basali nitida.

Long. ♀, 9 mm.

♀. Middle lobe of the clypeus longer than broad, flat, broadest near the base, the apical margin armed with four stout, blunt, short teeth. Antennæ inserted fully half as far again from the anterior ocellus as from the base of the clypeus, the second and third joints of the flagellum of equal length. Eyes parallel on the inner margin; the posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base; pygidial area elongate ovate, almost pointed at the base, narrowly truncate at the apex, nearly three times as long as the greatest breadth. Closely, but not very deeply punctured; the enclosed area at the base of the median segment smooth and shining, the median groove very indistinct. First recurrent nervure received a little before the middle of the second cubital cell.

Habitat—Pegu Hills (*Bingham*), April.

"Stores its nest with *Downesia brettinghami*" (*Bingham*).

Nearly allied to *C. tetradonta* Cam., but has the middle lobe of the clypeus much narrower than in that species and is more closely punctured.

The note about *Downesia* is referred by Bingham (Fauna Brit. India

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Hymen. I. p. 300) to *C. elizabethæ*, but is placed on this species in the collection.

The markings in the type are discoloured.

Cerceris kirbyi Bingh.

Cerceris kirbyi Bingh. Fauna Brit. India Hym. I., p. 313, 1897, ♀.

♀. Nigra, subnitida, capite punctato; clypeo, fronte, scapo, genis, vertice fascia, pronoto, tegulis, mesonoto maculis duabus, mesopleuris macula magna interrupta, scutello, postscutello, segmento mediano macula magna utrinque, segmento primo abdominali basi et apice, secundo dimidio basali, tertio macula basali nigra, quarto quintoque apice, pedibus ad anticis et intermedus flavis; flagello pygidioque ferrugineis; alis hyalinis apice leviter infuscatis; clypeo plano, apice quedridentato; segmento mediano area basali nitida, obsolete punctata, segmento ventrali secundo area basali elevata nulla; mesopleuris haud tuberculatis.

Long. 7 mm.

♀. Clypeus almost flat, broader than long, the anterior margin almost straight, armed with four well defined teeth. Antennæ inserted almost as far from the base of the clypeus as from the anterior ocellus; posterior ocelli half as far again from the eyes as from each other. Pronotum not depressed in the middle, mesopleuræ not tuberculate; second ventral segment without a raised basal area elongate, slightly broader in the middle than at the extremities, fully two and a half times as long as the greatest breadth and narrowly truncate at the apex. The first abdominal segment is about twice as long as broad. Head closely punctured, thorax and abdomen microscopically punctured. First recurrent nervure received at one-third from the base of the second cubital cell.

Habitat—Haundraw Valley, Tenasserim (*Bingham*). September.

Bingham's description of the colour and sculpture is not inaccurate, but his description of the form of the clypeus cannot be taken from the type, to which it bears no resemblance.

Cerceris rothneyi Cam.

Cerceris rothneyi Cam. Mem. Manchester Lit. and Phil. Soc. (4) III. p. 251, 1890.

♀. Ferruginea; fronte supra antennas, segmento abdominali quarto pygidioque nigris; clypeo, fronte, scapo, pronoto, tegulis, mesopheuris macula, scutello, postscutello, segmento secundo basi, tertio macula ferruginea basali quintoque pallide flavis; pedibus flavis, femoribus ferrugineis; clypeo apice truncato dentibus 4 minutis armato; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla; pygidio angusto, in medio contracto.

♂. Feminæ similis; vertice, mesonoto, segmentoque secundo apice nigris; clypeo apice anguste truncato.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Long. ♀, 12 mm.; ♂, 10 mm.

♀. Clypeus flattened, the middle lobe half as broad again at the apex as long; the apical margin straight, armed with four minute blunt teeth. Antennæ inserted almost as far from the base of the clypeus as from the anterior ocellus, second joint of the flagellum half as long again as the third. Eyes very feebly divergent towards the clypeus; a very minute spine projecting over the base of the mandibles; posterior ocelli as far from each other as from the eyes. Mesopleuræ without spines; second ventral segment without a raised area at the base; first segment a little broader than long; fifth ventral segment with the apical margin slightly produced in the middle and recurved, the segment raised laterally. Pygidial area very narrow, slightly narrower in the middle than at the extremities, rounded at the apex, three times as long as the greatest breadth. Closely but not coarsely punctured; the basal area of the median segment smooth and shining with an indistinct median groove. Wings hyaline, with a fuscous cloud at the apex, nervures fuscous, stigma testaceous. First recurrent nervure received at one-third from the base of the second cubital cell.

♂. Clypeus longer than broad, the apical margin rounded at the sides, narrowly truncate in the middle. Fisrt abdominal segment much longer than broad; pygidial area half as long again as the breadth at the base, slightly narrowed to the apex.

Habitat—Barrackpore (*Rothney*); N. Kanara (*Comber*).

Cerceris fastidiosa sp. n.

♀. Flava; vertice mesonotoque nigro-maculatis, segmentis dorsalibus rufo-fasciatis; clypeo convexo, porrecto, apice inter carinas duas triangulariter truncato; segmento mediano area basali sparse punctata.

Long. 11 mm.

Clypeus strongly convex, nearly as long as broad, obliquely depressed from near the middle, and furnished with two carinæ enclosing an elongate triangular and depressed space at the apex, the apical margin very broadly rounded. Cheeks narrower than the eyes at their greatest breadth; eyes nearly parallel; second joint of the flagellum distinctly longer than the third. Pronotum not depressed in the middle, rounded at the angles; mesopleuræ with two very minute spines. First abdominal segment much broader than long, subtuberculate at the base on the dorsal surface; second ventral segment without a raised area at the base, fifth ventral segment not raised at the apex. Pygidial area sparsely punctured, more than half as long again as broad, the sides almost parallel, broadly truncate at the apex. Closely punctured, more sparsely and shallowly on the abdomen than elsewhere; enclosed area at the base of the median segment sparsely punctured, divided by a very shallowly impressed line.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Yellow; a large black spot round the ocelli, mesonotum black with four broad longitudinal yellow bands, the margins and central line of the enclosed area on the median segment and a line continued to the apex of the segment black; first dorsal abdominal segment, pygidial area and the other dorsal segments broadly at the base light ferruginous. Wings hyaline, infuscated at the apex, stigma testaceous.

Habitat— Karachi (*Comber*).

This species somewhat resembles *C. pulchella* Klug, but is without the raised area at the base of the second ventral segment, the form of the clypeus on the oblique anterior portion is different, as is also the sculpture of the enclosed area at the base of the median segment.

Cerceris rhynchophora sp. n.

♀. Nigra, delicatissime punctata, etiam in area basali segmenti mediani; clypeo, fronte, scapo, macula magna post oculos, pronoto, tegulis, scutello, postscutello, segmento mediano macula utrinque, segmentis 1—5 fasciis latis, tibiis tarsisque flavis; alis hyalines, apice leviter infumatis; clypeo convexo, porrecto, nasuto, margine apicali sub rostro bidentatos; mesopleuris haud tuberculatis; segmento ventrali secundo area basali elevata nulla; area pygidiali triangulari, apice acuta.

Long. 10 mm.

♀. Clypeus porrect, convex, produced into a noselike process at the apex, the margin below the process with a tooth on each side. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum less than half as long again as the third. Posterior ocelli a little further from the eyes than from each other; the inner margins of the eyes parallel. Pronotum not depressed in the middle; mesopleuræ without tubercles; second ventral segment without a raised area at the base; first segment twice as broad as long, the abdominal segments broad and scarcely constricted at the base. Pygidial area granulate, of an elongate triangular shape, ciliated at the sides. Very finely and closely punctured, rather sparsely on the scutellum. First recurrent nervure received before one-third from the base of the second cubital cell.

♂. Differs from the female as follows: clypeus longer than broad, rounded at the apex, with three small teeth on the margin, and almost flat. The whole insect much more coarsely punctured; the basal area of the median segment shining, finely punctured, with short longitudinal striæ at the base. Abdominal segments constricted at the base; the first segment about half as broad again as long. Pygidial area as broad at the base as long, the apical margin truncate and less than half as broad as the base.

Habitat—Quetta (*Nurse*). May.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The female is very near *C. euryanthe* Kohl., in the shape of the clypeus and pygidial area, but seems to differ in the much finer sculpture and the proportions of the antennal joints.

Cerceris vigilans Sm.

Cerceris vigilans Sm. Cat. Hym. B. M. IV, p. 454, 1856, ♂.

Cerceris lanata Cam. Jour. Bom. Nat. Hist. Soc. XVII, p. 1009, 1907.

♀. Nigra; margine interiore oculorum anguste, macula post oculos, vertice macula parva utrinque, segmento primo dorsali macula utrinque, tibiisque linea, albis; segmentis abdominalibus 2—5 rufo-ferrugineis; alis fusco-violescentibus; clypeo apice anguste producto, recurvato; mesopleuris tuberculatis; segmento mediano area basali delicatissime punctata; segmento ventrali secundo area basali elevata nulla.

♂. Feminæ similis; pronoto utrinque albomaculato; segmentis dorsalibus 5—6 infuscatis; clypeo apice late rotundato, dentibus tribus armato; flagello subtus ferrugineo, fronte albo trilineato.

Long. ♀, 12-15 mm.; ♂, 9-12 mm.

♀. Clypeus a little longer than broad, the apical margin produced in the middle and recurved, the middle produced into a broad rounded tooth with a minute tubercle on each side of it at the base. Antennæ inserted more than twice as far from the anterior ocellus as from the base of the clypeus, the second and third joints of the flagelum equal in length. Inner margins of the eyes almost parallel; posterior ocelli half as far again from the eyes as from each other. Mesopleuræ with a small, blunt tubercle; second ventral segment without a raised area at the base; first segment nearly twice as broad as long; pygidial area elongate ovate, broader at the base than at the apex, twice as long as the greatest breadth. Closely and rather finely punctured, the enclosed space at the base of the median segment very minutely punctured, clypeus sparsely and shallowly punctured.

♂. Clypeus very broadly rounded at the apex and armed with three broad teeth; apical joint of the flagellum longer than the penultimate and strongly curved; pygidial area more than twice as long as broad, a little broader at the apex than at the base.

Habitat—Almost the whole of the Indian region, excepting Ceylon and the North-West frontier districts. Bingham's description of the female seems to have been taken from a male.

Cerceris leucozonica Schlett.

Cerceris leucozonica Schlett. Zool. Jahrb. II, p. 405, 1887, ♀ ♂.

♀. Nigra, clypeo, fronte, scapo, pronoto macula utrinque, tegulis, postscutello, segmentis abdominalibus primo, tertio, quarto, quintoque fasciis latis flavis; flagello fusco-ferrugineo, pedibus flavis, ferrugineo-variegatis; clypeo plano, ad apicem modice angustato, margine apicali

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

truncato, segmento mediano area basali basi longitudinaliter striata, segmento ventrali secundo area elevata nulla; alis hyalinis, apice leviter infuscatis.

Long. 9 mm.

♀. Clypeus a little longer than the greatest breadth, slightly narrowed towards the apex, the apical margin truncate. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, second joint of the flagellum as long as the first and third combined; the inter-antennal carina low, not reaching the base of the clypeus. Cheeks narrower than the greatest breadth of the eyes; posterior ocelli a little further from the eyes than from each other. Mesopleuræ without tubercles. First abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base; fifth ventral segment widely emarginate at the apex, depressed in the middle of the apical half. Pygidial area more than half as long again as the greatest breadth, gradually narrowed from the base and almost pointed at the apex. Deeply and coarsely punctured, more sparsely and shallowly on the abdomen; the enclosed area at the base of the median segment coarsely longitudinally striated at the base, punctured between the striæ, very finely transversely striated at the apex, with a deep median furrow.

Habitat—Quetta (*Nurse*). June.

Described by Schletterer from Hungary and Bulgaria. Typical specimens are without the broad yellow band on the basal abdominal segment. The entirely black second segment renders the species rather conspicuous amongst other Quetta species.

Cerceris nursei sp. n.

♀. Nigra, nitida, sparse punctata; clypeo, fronte, scapo, genis, vertice macula utrinque, pronoto, tegulis, mesopleuris fascia lata, scutello, postscutello, segmento mediano macula utrinque, segmentis abdominalibus 1—5 basi anguste nigro, pedibusque flavis, flagello anoque fusco ferrugineis; clypeo plano, apice truncato; segmento mediano area basali nitida, in angulis oblique striata; segmento ventrali secundo area basali elevata nulla.

Long. 9 mm.

♂. Feminæ similis, capite thoraceque minus flavo pictis; clypeo concave depresso, angulis apicalibus dente minuto armato.

♀. Clypeus almost flat, much broader than long and broadly truncate at the apex. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum a little longer than the third. Cheeks not quite as broad as the eyes; posterior ocelli about half as far again from the eyes as from each other; eyes diverging very slightly towards the clypeus. Pronotum not depressed

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in the middle; mesopleuræ without tubercles; second ventral segment without a raised area at the base; pygidial area gradually narrowed from the base, about three times as long as the greatest breadth and almost pointed at the apex. The abdominal segments are not strongly constricted; the basal segment broader than long. Sparsely punctured, very finely on the head and thorax, more coarsely, but shallowly, on the median segment and abdomen; enclosed area at the base of the median segment smooth and shining, with a few oblique striæ in the angles. First recurrent nervure received at one-third from the base of the second cubital cell.

Black; mandibles, clypeus, front, checks, a spot on each side on the vertex, pronotum, tegulæ, an irregular band on the mesopleuræ scutellum, postscutellum, a large spot on each side of the median segment, abdominal segments 1—5, very narrowly black at the base on the dorsal, broadly testaceous brown at the base on the ventral surface, and the legs bright yellow. Wings hyaline, slightly iridescent, with a fuscous cloud at the apex, nervures fusco-ferryginous.

♂. Clypeus as long as the greatest breadth, broadest in the middle almost the whole surface occupied by a concave depression of an oval shape, the apical margin transverse, armed with a small tooth at the apical angles. Apical joint of the flagellum very slightly curved, not quite as long as the penaltimate. Pygidial area less than half as long again as broad, truncate at the apex, the sides almost parallel.

Vertex and cheeks without yellow markings, median segment entirely black, the thorax with the pronotum, tegulæ and postscutellum only yellow; femora marked with black.

Habitat—Quetta (*Nurse*). May and June, 3 ♀, 1 ♂.

Cerceris circumcincta sp. n.

♀. Nigra; mandibulis basi, clypeo margine apicali nigro, margine interiore oculorum latissime, scapo subtus, macula pone oculos, pronoto utrinque, tegulis, postscutello, segmento mediano macula laterali utrinque, segmentis dorsalibus 1—5, ventralibus 2—4 fascia apicali, tibiisque axtus flavis; flagello subtus pedibusque testaceis; alis subhyalinis, apice infuscatis, nervulis fuscis, stigmate testaceo; clypeo brevi, apice truncato, depresso; mesopleuris haud tuberculatis; segmento mediano area basali apice punctata, basi striata; segmento ventrali secundo area basali elevata nulla.

♂. Feminæ similis; clypeo convex, nitido, apice truncato; segmento mediano area basali subnitida.

Long. ♀, 10 mm.; ♂, 9 mm.

♀. Clypeus short, slightly convex, shining, nearly twice as broad at the apex as long, the apical margin narrowly depressed. Antennæ inserted nearly twice as far from the anterior ocellus as from the base of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

clypeus, the second joint of the flagellum about half as long again as the third, eyes almost parallel; posterior-ocelli about half as far again from the eyes as from each other. Mesopleuræ without tubercles; first abdominal segment fully half as broad again as long; second ventral segment without a raised area at the base; pygidial area narrowly rounded at the apex, gradually narrowed from the base, a little less than twice as long as the greatest breadth. Very finely and not very closely punctured, enclosed area at the base of the median segment minutely punctured at the apex, finely striated at the base. First recurrent nervure received a little before the middle of the second cubital cell.

♂. Clypeus convex, shining, longer than broad, truncate at the apex. Antennæ inserted only a little further from the anterior ocellus than from the base of the clypeus, apical joint of the flagellum shorter than the penultimate. First recurrent nervure received just before one-third from the base of the second cubital cell.

Habitat—Kashmir, 5-6,000 ft. (*Nurse*). May.

Cerceris mellicula sp. n.

♀. Ochracea; fronte circa ocellos, mesonotoque nigris; prothorace, scutello postscutelloque flavis; alis hyalinis, apice infumatis; clypeo leviter emarginato, segmento mediano area basali nitida, area pygidiali apice leviter emarginata.

Long. 9 mm.

Clypeus nearly as long as the breadth at the apex, feebly emarginate on the apical margin, slightly convex, shining, with a few scattered punctures. Head closely but not deeply punctured, the front below the insertion of the antannæ almost smooth. Eyes parallel on the inner margin; second joint of the flagellum distinctly longer than the third; breadth of the cheeks equal to about half of the greatest breadth of the eyes. Thorax sparsely punctured, the scutellum almost smooth; pronotum slightly depressed in the middle; mesopleuræ with a minute tubercle. Median segment and abdomen rather closely punctured; the enclosed area at the base of the median segment smooth and shining, with a shallow median groove, which is continued more deeply to the apex of the segment. First abdominal segment a little broader at the apex than long; second ventral segment without a raised area at the base; apical margin of the fifth ventral segment very slightly raised. Pygidial area half as long again as the breadth at the base, where it is broadest, nearly twice as long as the breadth on the shallowly emarginate apical margin. First recurrent nervure received at one-third from the base of the second cubital cell. Ochreous; the front round the ocelli broadly and the mesonotum black; pronotum, pleuræ, scutellum and postscutellum yellow. Wings hyaline, strongly infuscated beyond the radial cell, nervures black.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Habitat—Karachi (*Comber*). October.

With this species I associate, with some doubt a male taken at Karachi in considerable numbers by Mr. Comber. It is yellow, with the vertex, cheeks, mesonotum, middle of the median segment and the base of all the abdominal segments narrowly black. Clypeus convex, more than half as broad again as long, narrowly truncate at the apex. Fifth and sixth ventral segments produced into a short spine on each side at the apical angles. Pygidial area about half as long again as the greatest breadth, broadly rounded at the apex, the sides parallel. Length 8mm.

The female somewhat resembles *C. annexa* Kohl., but has the clypeus and pygidial area much broader.

Cerceris bolanica sp. n.

♀. Nigra ; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento abdominali secundo basi, tertio quintoque totis, quarto apice, pedibusque flavis ; alis hyalinis, apice leviter infumatis, venis fuscis ; clypeo apice angustato, emarginato ; mesopleuris haud dentatis ; segmento ventrali secundo area basali elevata nulla ; segmento mediano area basali punctata.

♂. Feminæ similis ; clypeo latitudine latiore, apice rotundato.

Long. ♂, 7 mm. ; ♂, 6 mm.

♀. Middle lobe of the clypeus as long as the greatest breadth, much narrowed towards the apex, the apical margin slightly porrect and very shallowly emarginate. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, the second joint of the flagellum only very slightly longer than the third. Inner margins of the eyes parallel ; posterior ocelli nearly twice as far from the eyes as from each other. Mesopleuræ without tubercles ; first abdominal segment nearly half as long again as broad, second ventral segment without a raised area at the base ; pygidial area elongate ovate. First recurrent nervure received at one quarter from the base of the second cubital cell. Rather deeply punctured ; the enclosed area at the base of the median segment punctured with a longitudinal median groove ; postscutellum smooth.

♂. Clypeus longer than broad, rounded at the apex ; pygidial area about half as long again as broad ; first recurrent nervure received at two-fifths from the base of the second cubital cell.

In both sexes the third ventral segment is yellow, and the flagellum beneath reddish.

Habitat—Quetta (*Nurse*). July.

This is near *C. rubida* Jur., but in that species the antennæ are inserted nearer to the base of the clypeus, and the sculpture is much coarser. The present species may be identical with *C. vagans* Rad., but the description

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of that species is almost worthless for purposes of identification, and there is no figure.

Cerceris baluchistanensis Cam.

Cerceris baluchistanensis Cam. Ann. and Mag. Nat. Hist. (7) XX., p. 88, 1907. ♂.

♀. Flavo-ochracea; alis hyalinis, apice et in cellula cubitali secunda infumatis, venis testaceis; clypeo convexo, latitudine æquilongo, apice late truncato; mesopleuris bituberculatis; segmento mediano area basali sparse punctata; segmento ventrali secundo area basali elevata nulla.

♂. Feminæ similis; flavus; flagello segmentisque abdominalibus apice anguste pallide ferrugineis; mesonoto, vertice, segmentoque mediano basi sæpe nigro-maculatis; clypeo modice producto, apice truncato; mesopleuris haud tuberculatis.

Long. ♀, 12 mm.; ♂, 10 mm.

♀. Clypeus as long as broad, convex, broadly truncate at the apex. Antennæ inserted more than twice as far from the anterior ocellus as from the base of the clypeus, second joint of the flagellum less than half as long again as the third. Eyes diverging very slightly towards the clypeus; the posterior ocelli more than half as far again from the eyes as from each other. Pronotum not depressed in the middle; mesopleuræ with two small tubercles; first abdominal segment more than half as broad again as long; second ventral segment without a raised area at the base; pygidial area more than twice as long as the greatest breadth, slightly broadened towards the middle, half as broad again at the base as at the apex. Closely but not coarsely punctured, most sparsely on the mesonotum and scutellum; the enclosed area at the base of the median segment very sparsely punctured, with the usual median groove. First recurrent nervure received at one quarter from the base of the second cubital cell.

♂. Clypeus convex, a little longer than broad, shining and very sparsely punctured, produced and rather narrowly truncate at the apex. Mesopleuræ not tuberculate. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus; the apical joint of the flagellum strongly curved, a little longer than the penultimate. First abdominal segment as broad as long, with a slight depression on the middle of the apical margin; pygidial area nearly twice as long as the greatest breadth, slightly narrowed to the apex.

In both sexes there is a small fuscous spot on the petiole of the second cubital cell.

Habitat—Quetta (*Nurse*). May and June. ♂. Deesa (*Nurse*). August ♂ ♀.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

(INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

Part X.

WITH PLATES D2, D3, AND D4.

(*Continued from page* 1136 *of Volume* XX.)

FAMILY—PAPILIONIDÆ—(*continued.*)

Only one genus .. .. PAPILIO.

81. Papilio helenus, L., Race **daksha,** Hampson. (Pl. D3, figs. 26 ♂, 26*a* ♀.) Male and female *upperside*: brownish-black to rich velvety black. Forewing with four slender lines in cell from base to near end of cell and outer internervular hairy streaks of varying width from median area to near termen, yellow-brown; these latter giving in many specimens a golden-brown appearance in certain lights to the terminal half of wing. Hindwing with a more or less quadrate white spot in interspace 7, one more elongate similar spot in each of the two interspaces below, the three forming a very conspicuous discal white patch with the outer margin zigzag; this is followed by a series of intermarginal more or less imperfect claret-red rings in interspaces 1 to 5 that enclose large, intense black, oval spots; these rings may be obsolescent in the male or even entirely wanting in specimens from the damper regions. The number of the rings is variable also, the tornal one being always present. Cilia black alternated with white. *Underside*: duller opaque black, the forewing generally somewhat less black than the hindwing. Forewing similar to the upperside but the cellular and internervular streaks formed of scales, not hairs, greyish white in colour and much more clearly defined, the latter anteriorly do not reach the terminal margin but form a postmedial band, the upper streaks in some few specimens reaching the apex of the cell. Very occasionally, in the damper regions, the streaked postmedial band is somewhat prominently white at base of interspace 7 (between veins 7 and 8) and there is a corresponding white blurred spot on the upperside of wing. Hindwing: markings similar to those on the upperside but the upper spot of the discal white patch crescentic in shape, the whole patch generally narrower and the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spots that compose it divided by black veins ; the inner marginal series of rings are dull ochraceous-red and only the tornal and the ring in interspace 2 are more or less complete, the rest of the series reduced to a curved sub-terminal line of lunules from interspace 3 to 7 ; in addition there is an inner broad red lunular spot in interspace 2 in continuation of the inner portion of the tornal ring ; both the lunule and inner portion of tornal ring traversed by a line of bluish white scales ; the lunule sometimes continued in interspaces 3, 4 by an ochraceous mark in each to the lower outer angle of white patch. The uppermost spot of the white patch generally with some blue scales on the interval between it and the terminal red ring. The female generally has the rings on the upperside of hindwing and the markings on the underside larger and bolder. Exp. 80-150 mm.

Generally the average size of a male is 130mm., that of a female about 140mm., the latter generally running a little larger than the former.

Egg.—Nearly spherical, flattened where affixed to leaf. Surface finely dented, shiny. Colour orange blotched with red-brown pigment. D : 2mm.

Larva.—The caterpillar is very like that of *P. polymnestor* in colour, shape, and markings. The head is round and soiled watery white, hidden under segment 2 in repose ; exactly as in *polymnestor* in every way including the white dorsal line splitting down sides of clypeus. Segment 2 trapeze-shaped with front margin straight, lateral margins diverging backwards, the angle between the front margin and them rounded, somewhat thickened, without any tubercle ; segments 3 and 4 increasing in width with segment 5, which is the broadest part of the body ; segments 4, 5 flattened on top more or less, there being a crest or ridge running along the front margin of the former, ending laterally in an eye or ocellus, and a less prominent ridge on the hinder margin of the latter, both curved, the one convex forwards, the latter convex backwards and with its extremities curving to close to the eye of the more prominent ridge on each side of the larva, this lower crest continued forward in the lateral region below the eye as a thinner, yellowish line to the front margin of segment 2, bordering the green dorsal portion of larva from the greyish colouring of ventral parts ; the surface included between the ridges or crests is nearly elliptical in shape and shield-like as in *polymnestor*. The shape of body from segment 6 to anal end is sub-cylindrical, the sides somewhat flat and perpendicular to the flat ventral surface ; the anal end is perpendicular to the longitudinal axis of larva behind a white line between the dorsolateral tubercles of segment 13 which are nearer the hinder margin of that segment than the front margin, this white line being continued forward to join the subspiracular line at front margin of segment 12, thus limiting the dorsal green colour from the white of the anal clasper-faces, anal flap, and parts below and behind it. The surface of the larva is velvety and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Explanation of Plate D3.

Fig. 26. *Papilio helenus*, L., Race *daksha*, Hampson. ♂

,, 26*a*. ,, ,, ,, ,, ,, ,, ♀

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

smooth looking with a dorsolateral, small, fleshy, white tubercle on segment 13 on the white line ; there are no others. Spiracles of ordinary size, oval, fleshy light-brown with fine black border and a thicker black line inside parallel to margin. Colour of larva is a rich grass-green above the subspiracular enamel-white band which starts at base of anal claspers and runs forward to the front margin of segment 7 quite straight ; then, getting gradually thinner, on to segment 6 where it curves up to the supraspiracular region, bordering the dorsal green and leaving the ventral watery smoky grey colour between it and the crest of segment 5 protruding upwards in a triangle into the segmental membrane between the two segments 5 and 6 ; this segmental membrane is black ; the anal segment is white mottled with black ; the front margin of segment 2 and its continuation backwards to the crest on segment 5 is yellow ; the bases of legs and visible ventral portions of segments 2-6 is watery dark-grey ; there is a dark black-mottled grey broad band running diagonally across segments 8 and 9, bordered in front by a line running from above lower anterior corner of segment 8 up and back to dorsum in front of hinder margin of segment 9 where it meets the one on the other side; behind it is bordered by a line starting from hinder margin of segment 8 up that margin and then back to hinder margin of segment 9 subdorsally, the band getting narrower on dorsum ; segment 10 is grey-mottled with black behind a light line starting at anterior margin of segment 10, curving backwards and up to the subdorsal region of segment 10 where there is a semicircular production of the dark mottling forward on either side of larva, the dorsal part of the complete transverse band formed by the markings on either side being its narrowest part ; vertex greyish ; true legs brownish ; pseudo legs large, thick and fleshy, greyish, marked with two transverse dark lines. The eye of segment 4 is black with a transverse brown line and a yellow-brown border ; the crest is finely veined with black between the eyes as in *polymnestor* ; the hinder crest is lighter green with slight white markings and violet loops, also as in *polymnestor*. The scent organs are deep flesh-coloured. L : 75mm ; B at segment 5 : 12mm.

Pupa.—The pupa is very similar in general shape to that of *P. polymnestor*. The front part of the longitudinal axis is inclined at an angle of 90°, slightly more than in that species, to the hinder half ; the head-points are perhaps slightly longer as they are certainly stouter and are perhaps also thrown back very slightly ; the front slope of thorax is quite perpendicular to the longitudinal axis at that point ; the extremities of the greatest width of pupa are perhaps more prominent and are somewhat flattened above and below. The surface is very much rougher, and there are prominent subdorsal tubercles on segments 8, 9 as well as a smaller lateral one and indications of such on segments 10, 11. Spiracles of segment 2 indicated by little semicircles on the surface of the segment with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the common margin of segments 2 and 3 as bases; other spiracles oval light brown in colour with white linear central slit, not small, more or less flush. The colour is ordinarily green with a similar yellow saddle to that described for *P. polymnestor*. If the pupa is against a grey bark or in a cage then it may be variegated with brown and pink, black and grey, white and green all together, in which case there is of course no yellow saddle. L: 45mm; B at segment 7: 19 mm; at shoulders: 6·5mm; L of head-points, 3mm.

Habits.—The larva, when full grown, generally lives in the centre of the upperside of the leaf, lying along the mid-rib always when it is young. Sometimes, when mature, it prefers, like most other *Papilio* larvæ, the stalk of the leaf or a twig. It is slow in its halting movements and wanders to pupate. The young larva is one of those that imitate bird-droppings by the pattern of colouration and its oily look and somewhat irregular surface. The imago deposits its eggs, one at a time, on mature leaves of the foodplant in shady places in heavy jungle, choosing, as a very general rule, small saplings with foliage about 10 to 20′ from the ground. Two larvæ are often found on the same little tree with very few leaves left between them at the end of their growth. The pupation takes place on the underside of a twig or strong leaf-rib and the loop is rather long, longer than in *polymnestor*. The yellow saddle adds greatly to the difficulty of seeing the pupa from below and it is always difficult to find amongst the green leaves of the plant where it is formed. The larva wanders sometimes long distances before turning into a chrysalis. The imago is an insect of the jungles and hills and regions of heavy rainfall; it is never found far away from these, but may stray into the plains along the borders. It flies fast, always seems to be in a great hurry, even when stopping to hover for a moment over a flower for food, and is rarely seen at rest. It is fond of the big jungles and keeps entirely to the protection of trees, often very near the ground, never seems to bask in the sun and comes to rest in dull weather on the upper surface of some leaf, often high up in the tops of trees, with its wings held quite horizontal, the upper wing drawn down over the hinder one so as to completely hide the conspicuous white patch on the latter. It is then not very easily seen and the position is evidently assumed for the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

purpose of protection from enemies, particularly birds. *P. daksha* is one of the finest butterflies of India in point of size and quiet beauty; it is one of the four really large ones mentioned in these papers and is not likely to be forgotten once seen. The insect is on the wing all the year round but is commonest during the monsoon months. The food plants are rutaceous; it has been bred on *Zanthoxylum Rhetsa*, DC.; *Glycosmis pentaphylla*, Correa; *Citrus medica*, L.; *Citrus decumana*, L.; all more or less evergreen trees and widely distributed in the Indian region with the exception of the first; but there are other species of *Zanthoxylum* that are found in places where *Z. Rhetsa* is not. *P. daksha* is confined to Southern India, the Nilgiris, Malabar and Travancore; its place is taken by *mooreanus*, Rothschild, in Ceylon and *helenus* L., in the Himalayas from Mussoori to Sikkim, hills of Assam, Burma, Tenasserim, Siam, China and the Malay Peninsula, both these differing very little though more or less constantly in small points from *daksha*.

The figures in Pl. D3 have the ground colour slightly too red, the fault being greatly accentuated in the lower or female insect: this latter is altogether too light, females in nature being very nearly as black as males; the picture must have been painted from a faded specimen.

82. Papilio polymnestor, *Cramer*. (Pl. D4, fig. 27 ♂, 27*a* ♀).—Male *upperside*: rich velvety black. Forewing with a postdiscal band composed of internervular, broad, blue streaks gradually shortened and obsolescent anteriorly, not extended beyond interspace 6, very rarely into interspace 7. Hindwing: the terminal three-fourths beyond a line crossing the apical third of the cell blue or greyish blue, with superposed, postdiscal, subterminal and terminal series of black spots; the postdiscal spots elongate, inwardly conical; the subterminal oval, placed in the interspaces like the postdiscal ones; the terminal irregular, placed along the apices of the veins and anteriorly coalescing sometimes more or less with the subterminal spots. *Underside*: opaque black. Forewing with an elongate red spot at base of cell; the postdiscal, transverse series of streaks as on the upperside but grey tinged with ochraceous and extending right up to the costa; in some specimens similar but narrow streaks in the cell. Hindwing with five irregular small patches of red at base, the one nearest dorsal margin sometimes wanting; the outer three-fourths of the wing touched with ochraceous but generally narrower than the blue on the upperside, the inner margin of the colour crossing the wing beyond the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

postdiscal and subterminal black spots as on upperside but much larger. In some specimens this grey area is much restricted, the subterminal spots merge completely with the terminal and form a comparatively broad black terminal band. Antennæ, head, thorax and abdomen blackish-brown. Female very similar, but the internervular streaks on the forewing paler, extended into the cell both on the upper and undersides. Hindwing with the pale blue of upperside and the corresponding grey area on the underside paler, generally more ochraceous along inner margin of the area. In some specimens there is a diffuse short red streak in base of cell of forewing on upperside. Exp. 131-156mm. A perfect male has been bred 110mm. The females are generally somewhat larger than the males.

Egg—The egg is light green when first laid but becomes orange-yellow after some hours' exposure. It is spherical and 1·8mm. in diameter; the surface is smooth.

Larva.—The larva is of the same type as that of *P. polytes* but, of course, much larger. Head more or less round, large, face rather flat; surface finely frosted, somewhat shiny, covered, especially about lower portion, with numerous short, fine, more or less erect, light brown hairs; clypeus small, equilaterally triangular, the apex rounded, rayed transversely, shiny watery green in colour; labrum transverse, whitish, shiny, as is also the somewhat large ligula; colour of eyes glassy white, one or two brown; antennæ and jaws greenish white, both tipped brown; the rest of the head light green with a pure white line down centre, splitting down each side of clypeus and forming thus a much larger triangle than the included clypeus. The body is more or less circular in transverse section, much swollen at segments 4 and 5, the head is generally hidden from above under segment 2 which is trapeze-shaped, the front margin straight, the sides diverging backwards from it in a rounded, somewhat thickened angle where, however, there is no sign of a tubercle (at the angles), the dorsum transversely convex, the dorsal line somewhat ascendant; the anal end is high, falling suddenly, nearly perpendicularly to the longitudinal axis of larva, from a slight raised ridge along middle of segment 13 joining the dorsolateral small tubercles of that segment; the anal flap, forming the major portion of this perpendicular hinder slope, is also trapeze-shaped, ending square and has a triangular, shiny dorsal shield near its extremity; it is closely applied to the broad outer faces of the anal claspers and is coloured like them greyish-white; segment 3 is shaped like segment 2, widening out backwards and sloping slightly upwards; segments 4 and 5 assume dorsally the shape of a semielliptical, somewhat flattened shield, the front boundary of which is formed by a prominent curved ridge, differently coloured to the rest of the body, stretching along the front margin of segment 4 and ending laterally in a black ocellus or eye, the hinder limit being a similar ridge along the hinder margin of segment 5, also slightly curved; both

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Explanation of Plate D4.

Fig. 27. *Papilio polymnestor*, Cramer. ♂

„ 27*a*. „ „ „ ♀

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ridges converging towards each other in the lateral region but not meeting; the hinder ridge continued, narrower, as a white line forwards laterally along segments 4, 3 to the front margin of segment 2, thus separating the dorsal green portion of larval body from the watery greenish grey of the ventral parts; after this shield the body decreases gently in diameter to the anal end, the dorsum transversely convex, the sides more or less flattened and perpendicular to the flat ventrum or underparts. The surface of the body is dull and velvety looking but is covered with extremely minute erect hairs when looked at under the lens; there is a small dorsolateral, short, fleshy tubercle near hinder margin of segment 13, coloured white-grey, on a similarly coloured, very slightly raised line which separates the green dorsal colour of the body from the hinder slope, and this line is continued forwards and down, still separating the dorsal green from the lateral grey, to join the white subspiracular line at front margin of segment 12. Spiracles not large, somewhat narrowly oval, light-brown, bordered very finely black with a broader black line inside and parallel to their margins. The colour of larva is a fine rich velvety, darkish grass-green on the dorsal portions with a yellowish shade above the lateral white line of segments 2-5 and above a pure white, subspiracular band starting from the base of the anal claspers and running forwards to the front margin of segment 7 whence, on segment 6, it curves upwards, getting thinner, to lose itself in the supraspiracular region at the front of that segment, leaving a triangle of ventral colour, between it and the swollen hinder ridge of the shield of segments 4 and 5, intervening between the dorsal green as far up as the subdorsal region; indeed, when the larva is stretched, the segmental membrane between segments 5 and 6 is visible right round the larva and the hinder half of the membrane is jet black dorsally and dorsolaterally; the ridge along front margin of segment 4 is ornamented with a fine, thin, black line running in deep open loops from eye to eye and finally, bordered posteriorly with white, encircling the black eye in a forward loop, the anterior part of which is anteriorly bordered with yellow; the eye itself is about 3mm. in diameter, has a dull blue, thin line transversely across its middle and two contiguous, thinly black-bordered, small, enamel-white spots above it towards dorsum of larva; in front of this line of loops and on front of ridge are two parallel, thin, black lines, more or less interrupted throughout their length, with some six thinly black-bordered circles let in between them; the ridge along hinder margin of segment 5 is, like this other ridge, lighter green than the body-colour generally, has no black lines but has the surface of the shield portion of the segment running into its tumidity in little open loops which do not reach its hinder margin and these loops are all coloured violet, fading gradually forwards into the glaucuous green of the whole shield; the loops become white towards the extremities of this hinder

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ridge; besides all this marking there is, on each side of segments 8 and 9, a broad, thinly white-bordered, thickly white-sprinkled band, limited anteriorly by the white border reaching, from the front margin of segment 8 at the subspiracular white band, up and backwards, crossing the common segment margin 8/9 in the dorsolateral region to meet the posterior limiting line in a curve subdorsally (the bands on either side therefore do not meet over back), this posterior boundary then running down, parallel to the anterior one, to the subspiracular band at posterior margin of segment 8: on segment 10 there is a similar white-sprinkled area occupying the spiracular region on each side, triangular in shape, bordered in front by a white line starting from the front margin at subspiracular band and running back to hinder margin in the lateral region, below by the subspiracular line, and behind by the hinder margin of segment; the front margin of segment 2 is yellowish white; true legs are green; the prolegs also greenish with two transverse dirty lines; the anal claspers are whitish; venter light-green. The osmateria or scent-organs are flesh-coloured. In some larvæ there may be a small subdorsal tubercle in middle of segment 12. There is generally a small blue subdorsal spot near the hinder margins of segments 9, 10; on the former in the band and another below; on the latter segment the place of the blue spot may be taken by a triangular small white patch blotched with blackish; there may be a whitish dot dorsally on segment 4 and a lightish one subdorsally on segment 5. L: 75mm.; B at segment 4/5: 12mm.

Pupa.—The pupa is bent back from about the middle so that the longitudinal axis of the one-half is at an angle of about 80° with that of the other half; the wings ventrally describe a prominent curve along their line of junction and the ends of this curve run straight and evenly to the points of the head forward and the cremastral end backwards; the dorsal outline is correspondingly concave in the middle but convex again in segments 8 and 9, with segment 7 gradually sloping up to 8 from the bottom of the curve, segments 6 and 5 forming the lowest part of it, segment 4 sloping up again towards thorax and, with the hinder half of thorax-length, in a straight line as far as the thoracic apex, whence the front half of the thorax falls suddenly at an angle of about 100° to the hinder slope in a slight curve to its front margin, after which segment 2 is nearly parallel, although slightly concave, to the longitudinal axis of pupa at that point. In lateral outline segment 2 is nearly parallel-sided and in continuation with the exterior margins of the head-points, but gets very slightly broader backwards; the shoulders are somewhat suddenly prominent, after which the pupa is again parallel-sided as far as the constriction where the body-loop passes; after this the wings (and body) are expanded as far as middle of segment 7, the greatest breadth there culminating in a low rounded point; then the breadth again diminishes rapidly to hinder

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

margin of the segment, less rapidly somewhat to hinder margin of segment 8 and more gradually to the cremastral end of pupa. The head has two diverging straight, thick parallel processes, bluntly pointed, triangular in section, toothed roughly on their inner edges and separated from each other by a triangular sinus; segment 2 has the front margin nearly straight with a triangular sinus in dorsal line; the apex of thorax points forwards and has two ridges, starting at apex subdorsally, running divergingly backwards to the hinder margin of the thorax where they again converge, the surface included by them more or less flat; the anal end has the segments 12, 13, 14 cut away underneath more and more backwards so that segment 14 is wedge-shaped, the extreme end quite thin and concavely curved: the sides are perpendicular and the dorsum flat. The front of shoulders is somewhat flattened. The wings are produced at the apices into a triangular point as far as hinder margin of segment 9. The surface is very slightly shiny, not quite smooth and minutely tuberculate on shoulder, head-points the extremities of the extreme width, the flat dorsal portion of thorax as well as on the saddle; there is a small tubercular dot laterally on segment 4 and another in front; there may be indications of tubercles on segments 7, 8, 9 and thorax corresponding to those in *P. helenus*. Spiracles of segment 2 are indicated by narrow linear, light brown ovals between the segment margins 2, 3; other spiracles broadly oval, green, with narrow central brown included ovals; they are flush, that of segment 7 situated at the base of the knob at extremity of extreme width; that of segment 12 blind. Colour is medium grass-green with a yellow green "saddle" bounded anteriorly by the hinder margin of thorax shortly (this hind margin by the way is straight and meets the wing-line in a shallow curve-angle of about 90°), laterally by the dark-green of wing-expansion in a straight line to the points of greatest pupal width, and gradually fades backwards into the green of abdomen; there is blue-grey suffusion on lateral ventral parts of abdomen, on the sides of segments 11-13 and along the dorso-ventral border of ventral parts of segments 3-7 on wings; there is a brown mark along the line separating the saddle from the dark green of segment 4; the suspensory hairs of cremaster are brown. The pupal surface is slightly depressed in the spiracular region of segments 12, 13; there is an indentation just in front of spiracle of segment 2; there is a white dot at extremities of veins of wings. L: 40mm. over all; B at segment 7: 18 mm; B at shoulders: 10mm; of segment 3 middle: 6·5mm.; L of head-process: 3mm.

The pupa is only green when it is formed amongst green leaves. If it is formed on a grey branch out of their influence or in a cage in captivity it may be quite different; often it is variegated, in these latter cases quite wonderfully with white and brown and grey and green and black to suit its surroundings.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Habits.—The eggs are laid always singly on the top of a leaf and generally on a leaf of a certain age. The imago chooses a shady place in the jungles or in a garden, and the leaf chosen is never far from the ground, that is to say, within about ten feet high and always on a plant bearing young leaves. The little larva eats the egg-shell and shortly afterwards makes a seat of web near the edge of its leaf upon which it comes to rest. Later on, when larger, it rests in the middle along the midrib moving, of course, as occasion requires, to a new leaf. When in the last two stages, as soon as it dons the green coat, it sits on stalks, twigs and branches, resting with the body stretched, contracting the first four segments, the face bent down along the leaf-surface. When touched it emits the flesh-coloured osmateria which smell strongly and pungently of the leaves of the food-plant. The pupation takes place suspended from the underside of a leaf-stalk and leaf or from a thin twig, the loop being moderately long. The caterpillar walks in a halting fashion, slowly, spinning web from side to side as it progresses; it travels all over the plant to eat and, at the end, changes its resting place pretty frequently. It does not appear to be much parasitised, though the eggs often suffer in this way. The imago appears after twenty-one days in the most favourable case, the time spent in the pupa varying according to the dryness or otherwise of the weather; in captivity a pupa will often lie over for months. The butterfly is very similar to *P. helenus* in its habits of flight and choice of localities. It, also, does not, usually, fly at any height from the ground though it will occasionally rise to the tops of trees, especially when in search of food; both males and females are commonly found at flowers. The males may often be seen drinking on the moist mud on roads or the wet sand in nallas and rivers at the commencement of the monsoons and in the hot close days that precede them. The species is one of the most plentiful in individuals in the regions where it exists and may be found about at any time of the year. It is however much commoner in the hills at low elevations and in jungle country than in the Plains and is not found in regions of very scanty rainfall. The flight is powerful and quick and generally straight ahead though, when alarmed, the insect dodges with great alacrity and is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

not exceedingly easy to catch with a net. Like all others of its class, it will come to decoy---a dead specimen pinned on a leaf or on the ground with its wings spread open---and even to a piece of light blue paper similarly exposed. The resting position is that already described for *P. helenus*, namely, with the wings spread horizontally, the front ones drawn down well over the hindwings so as to partially hide the striking blue colour; a leaf low down in the jungle is generally chosen---a leaf in a protected position with others above to shade it from the sun or cover it from the rain. *P. polymnestor* is found throughout Southern India, the Central Provinces, Bengal, and, as a straggler from the Plains, Sikkim. Its place is taken in Ceylon by a very nearly allied species, *P. parinda*, Moore, which differs in the extent and shade of the blue markings. There are others, varying somewhat in markings, but constant where they occur, confined to Java, Sumatra and Borneo, &c., respectively. *P. memnon* inhabits Java, Nias, Sumatra, Borneo, &c., and has a tailed as well as a tail-less female. Rothschild enumerates four subspecies of this last form from different Malayan Islands, *P. mayo*, *P. rumanzovius*, Eschsch., *P. deiphobus*, L., *P. deiphylus*, Feld., *P. deiphontes*, Feld., *P. ascalaphus*, Boisd., and *P. œnomaus*, Godart, some with both sexes tailed, some tail-less or with a short tooth instead of the tail, are given as inhabiting other Malayan Islands and New Guinea. The food-plants of the larva are all belonging to the *Rutaceæ* and it has been found on *Glycosmis pentaphylla*, Corr., *Atalantia* of different species and *Citrus decumana*, L. This last plant is the Pomelo or Shaddock, cultivated nearly everywhere in India. In the forests of Western India, south of Bombay, the commonest food-plant is *Paramigyna monophylla*, Wgt., a large, climbing, armed shrub with a simple leaf and a round, green berry about an inch in diameter which is shortly grey-woolly when young.

Plate D4 depicts the male and female. Both are again too red, the usual fault. The female is far too light both as to ground colour and the blue colouration, in nature the ground colour is nearly as black as the male.

83. Papilio polytes, *L.*—(Pl. D2, figs. 25 ♂ *cyrus* form; 25*a* ♀ *polytes* form; 25*b* *romulus* ♀ form).—A polymorphic form.—The male varies slightly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but is fairly constant throughout its range; the female generally with two forms, in Southern India and Ceylon with three, strikingly different in appearance.

Male and female *upperside* black. Forewing: cell and rest of wing with not very prominent, irrorated adnervular bands of pale, yellowish scales and admarginal white specks along the termen. Hindwing: a transverse discal series of elongate white spots in the interspaces 1-7, these spots divided by the black veins and succeeded by diffuse, ill-defined, sparse blue scaling (sometimes obsolescent or wanting in most interspaces) on the postdiscal area; an obscure spot of a deeper black than the ground-colour at the tornal angle surmounted by a lunule of blue scales. *Underside* similar; ground-colour of a duller, more opaque black. Forewing with the cellular and internervular irrorated streaks more prominent. Hindwing: the discal series of white spots and blue scaling succeeded by a subterminal, more or less incomplete series of dingy white lunules and a row of small admarginal spots in the interspaces along the termen; the tornal spot divided from the blue scaling by an ochraceous line (sometimes very indistinct). Antennæ, head, thorax and abdomen black; head and thorax anteriorly on the upperside and head, thorax and abdomen beneath spotted with white; the last with lateral, white lines.

Cyrus form differs:—male *upperside*: the white markings larger, more neatly defined, the tornal spot with an ochraceous short band above it. *Underside*: the subterminal series of lunules are complete, well defined, and vary from white to deep ochraceous-red. Certain specimens have a subterminal band of white lunules on the upperside also (from the Nicobars); others, from the Western Ghats, Kanara, have it of deep ochraceous-red lunules. Female: similar to the male, the subterminal series of lunules on the underside ochraceous. This is merely a form and every phase between it and typical *polytes* is found in Bombay Presidency and in one and the same locality.

Female, *polytes* form.—*Upperside*: fuliginous black on fore, somewhat darker and velvety on the hindwing. Forewing with broad adnervular pale lines on disc, narrower in cell, leaving the base of wing from $\frac{1}{3}$ of costal length to $\frac{2}{3}$ of dorsal margin, and internervular lines and the terminal margins fuliginous black. Hindwing: apex of cell and elongate marks from base of interspaces 2-5 white; lower half of interspace 1 dark-red with blue scales and with a superposed terminal black spot at tornus; the red extends into interspace 2 below the elongate white mark (others have it extending all round the white mark); finally a complete subterminal, transverse curved series of red lunules and admarginal paler red spots often with a narrow terminal yellowish white line beyond them in the posterior interspaces. *Underside* similar; a complete series of admarginal spots along the termen of the hindwing, the anterior spots white.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Explanation of Plate D2.

Fig. 25. *Papilio polytes*, L., *cyrus* form. ♂
,, 25*a*. ,, ,, ,, *polytes* form. ♀
,, 25*b*. ,, ,, ,, *romulus* form. ♀

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Antennæ, head, thorax and abdomen black; beneath, the abdomen with lateral rows of white specks. This specimen is typical; but the insect varies a good deal. Often the cell of the hindwing is uniform black to the apex and the number of elongate white marks in the interspaces beyond varies from 2 to 6; even the two may be sometimes very curtailed in extent.

Female, *romulus* form.—Resembles the ordinary female *polytes* form but differs as follows:—Forewing crossed from the middle of cell obliquely to the tornal angle by a broad white band somewhat as in *P. hector*, the margins of the band ill-defined; this is followed by an ill-defined, white patch beyond the apex of the cell. Hindwing with all the discal as well as the subterminal and terminal markings red, including a round red spot at apex of cell. The white band and patch are sometimes much sullied and it varies also in width in different specimens. Exp. 92-114mm: the male generally under 100mm.

Colonel Bingham mentions two remarkable aberrations of the male, both from Southern India. In one the *upperside* forewing had the admarginal white spots along the termen much larger and extended into interspace 8. The hindwing had the transverse discal series of elongate white spots replaced by a series of velvety-black spots darker than the ground-colour of the wing, bordered on the inner side narrowly, on the outer side much more broadly, by ill-defined, diffuse, blue scaling; the black tornal spot in interspace 1 centred by an irregular deep ochraceous red-spot; above this is a quadrate white spot and in a line with it in interspace 2 is a similar but narrower white spot; there is a minute white discal spot in interspace 5. *Underside* similar to the upperside, the ground-colour duller; the markings on the forewing similar, but the terminal white spots still larger. Hindwing: a discal series of extremely elongate streaks in the interspaces beyond the cell; these streaks are rich ochraceous-red mixed with white, but turn to pure white without any red in the anterior interspaces; the streaks in interspaces 1-5 interrupted along their inner halves by a row of spots of a shade darker than the ground-colour of the wing: these spots outwardly bordered by diffuse blue scaling. Exp. 98mm. Procured at Coimbatore, S. India.

The other abnormal specimen, also a male, closely resembled typical specimens but, on the hindwing, the white spots of the transverse discal series are wanting in interspaces 1-3, 7. This gives the insect a superficial resemblance to *P. daksha*.

Egg.—Spherical; hardly perceptibly rough on surface. Colour pale orange, opaque, shiny, smudged with pale-brown. D: 1. 2mm.

Larva (Pl. I, fig. 14).—Is the same as that of *polymnestor* in shape and arkings except that segments 4 and 5 are not so swollen; the head is w instead of green, the crests on segments 4 and 5 are yellow, the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ocellus black. There are the usual two tubercles on segments 2 and 13, the former small and triangular pointing sideways and forwards, the latter smaller, pointing straight backwards. The colour is a rich glaucous green dorsally, slightly yellowish on the sides; the bands and markings on segments 7-10 are white, blotched with red-brown or brown, generally spottedly, the ventrum in brownish white suffused with red-brown or brown. L: 40 when at rest and the B: 8 mm. at middle, a little more at segment 4. This is a moderate-sized larva.

Pupa. (Pl. I, fig. 14*a*.)—Is very similar to that of *P. daksha*, but the apex of the thorax is produced into a short square-topped point which is directed forwards and overhangs the front slope. The colour of the pupa is identical with that of *P. daksha* both when wild and in captivity. L: 31mm; B: 12 mm. at broadest part, segment 7; greatest H: 9 mm. at segment 7.

Habits.—The habits of the larva in all its stages are the same as those of *daksha* and *polymnestor*. The pupation also takes place in the same manner except that the loop is here perhaps not as long as in the other two. The caterpillar is seemingly not very subject to attack by ichneumons though, of course, it suffers occasionally like all butterfly larvæ. The imago flies well and strongly, though it rarely rises far from the ground, preferring the shelter of bushes and thick places in the jungles and along hedges, in gardens, &c.; it eschews open ground though it is found everywhere in India, in the Plains as well as in the hills, in the densest forest in the regions of heaviest rainfall and in the gardens of the driest parts of the country. It is the male that generally attracts attention, darting across a path and diving into a shady bit of shrubbery or into some thick place in the underwood, or stopping for a short moment at some flower for a passing drink. The females are somehow much less noticeable. The reason is probably because they keep more to the shady places, fly slower and are nearly always strictly attending to the business of ovipositing. It is a fact that they fly much slower as a practice though they can rival the male in quickness when necessity arises---when, for example, they are attacked or frightened. The resemblance of the *polytes* and *romulus* form of the females of this butterfly to *P. aristolochiæ* and *P. hector* respectively has been alluded to in these papers before. These last two swallow-tails have a habit of flying about slowly (*pandiyanus*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

has it too), when feeding in the mornings and evenings, from flower to flower, sailing along with the wings held over the back at about 45° to each other at intervals. It is to imitate these the better, perhaps, that the females of the present species affect a slower rate of progression than their males. While the protected insects, however, feed mostly, as said, in the mornings and evenings, these others are not addicted to that practice but feed at odd times throughout the day; they are seen generally in the underwood and shady places looking for leaves whereon to deposit their eggs. The *cyrus* form of the female is nowhere common in the Bombay Presidency as far as is known, whereas both the other forms are equally plentiful. It is probable, indeed, that the form is nowhere very plentiful throughout the range compared to the *polytes* form. The form imitating *P. hector—romulus*—is found only in the area frequented by *P. hector*; a very peculiar fact. Another extraordinary thing is that where local forms of *P. aristolochiæ* occur, there the *polytes* form is also modified in a more or less similar way. Things go even further than that: in Celebes where typical *polytes* males do not exist, being replaced by a constant similar but aberrant race called *P. polytes alcinder*, Oberth., the female is only of one type and that imitates a butterfly of the *P. hector* group called *P. polyphontes*, Boisd., which is only found in Celebes and some few neighbouring islands of the Gilolo group; and this although *P. aristolochiæ* exists there. Why? It is difficult to even guess at an answer.

P. polytes is found throughout British India, including the Andamans and Nicobars; extending to Siam and the Malayan Subregion to Celebes; China and Formosa.

The food-plants of the larva are *Zanthoxylum Rhetsa*, DC.; *Glyscosmis pentaphylla*, Correa; *Citrus medica*, L.; *Citrus decumana*, L.; and others of the *Rutaceæ*.

The figure 25*a* on Plate D2 has the fore wings much too red; the light parts should be grey or blue-grey. The figure of the male is very good (fig. 25).

84. Papilio clytia, *L.*—There are two forms: one something like a *Euplœa core*, dark-brown with white bordering marks; the other the same with broad white streaks between the veins, imitating *Danais limniace* perhaps; and males and females of both are equally common.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Male and female, *first form.—Upperside* : velvety black or soft brown. Forewing with a subterminal series of outwardly truncate or emarginate white spots; the spot in interspace 4 shifted inwards out of line; those in 6, 7, 8 oblique to costa, the lowest and the upper two elongate; this followed by a terminal series of smaller white spots, two in interspace 1, one above the other and two in interspace 8; finally, a single spot between the subterminal and terminal series. Hindwing with a discal series of inwardly conical and outwardly emarginate, triangular, elongate, white spots in interspaces 1-5; a subterminal series of four white lunules in interspaces 2-5, the series continued in interspaces 6 and 7 as transversely oblong, white spots; a prominent, tornal, yellow spot broadly divided across the middle by a bar of the ground colour. The cilia touched with white in the interspaces; sometimes one or more of these specks on the cilia are broad, prominent and yellow in colour. *Underside*: from soft, pale brown to rich, dark, velvety brown. Forewing with the markings as on the upperside. Hindwing with the markings also similar to those on the upperside but the terminal margin beyond the subterminal series of white markings bears a row of comparatively large, very conspicuous, yellow spots, separated from the white lunules by a series of short, transverse, detached spots of the ground colour. Antennæ, head, thorax and abdomen black; the thorax anteriorly and beneath, and the abdomen on the sides, spotted with white.

Male and female, *second form* (*dissimilis*, Doubleday).—Differs from the first form as follows:—*Upperside*: forewing: cell with four streaks coalescent at base and four spots beyond at apex, a long streak in interspace 1*a*, two streaks with two spots beyond, which are more or less coalescent with them, in interspace 1, a broad streak with an outwardly emarginate spot beyond in interspace 2; similar spots, one at base and one beyond, in 3; a single similar spot in 4; elongate streaks in 5 and 6, and much smaller elongate spots in interspaces 8 and 9. All these streaks and spots cream-white with diffuse edges; subterminal and terminal markings as in the first form. Hindwing: markings similar to those in the first form, with the following differences:—discoidal cell entirely white; discal white streaks longer, reaching quite up to the outer margin of the cell and continued anteriorly to costa by elongate streaks in interspaces 6, 7; two spots in interspace 8 and a slender streak along costa; the subterminal and terminal markings as in the first form. *Underside* similar to the upperside, the cream-white markings slightly larger, the terminal series of yellow spots on the hindwing as in the first form. Antennæ, head, thorax and abdomen with more prominent white spots. Exp. 108-121mm.

The first form is liable to certain variation:—the forewing may have a third (discal) series of one to five markings; it is then variety *casyapa*, Moore; the forewings may be black with an obvious bluish tint in certain

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lights ; the white spots of forewings are absent or only faintly visible: variety *papone*, Westwood ; variety *commixtus*, Rothschild, was received from the Khasia hills and had the three series of spots on the forewing of *casyapa* very feebly marked with two faint spots behind the cell and a streak along the dorsum, white ; the discal markings often indicated by white scales, or absent altogether ; the hindwing with the apical half of cell, seven long discal streaks reaching the base of respective interspaces and a marginal and submarginal series of spots, white as in *dissimilis*, L. (From Rothschild's "Revision of the *Papilios* of the Eastern hemisphere, exclusive of Africa.")

There are other races :—*lankeswara*, Moore, from Ceylon ; *panope*, L., from Burma and Tenasserim, extending to Siam and the Malay Peninsula ; *flavolimbatus*, Oberthür, from the Andamans. All of these have a *dissimilis* form which does not vary much ; the last (*flavolimbatus*) has only the *dissimilis* form.

Egg.—This is spherical, waxy looking and often somewhat uneven on the surface, orange-yellow in colour and about the same size as that of *P. helenus*.

Larva.—(Pl. 1., fig. 13).—Is somewhat of the *hector* type though slimmer, is more or less cylindrical, thickest in the 5th and 6th segments. The anal flap is rather long, semi-elliptical in shape, at an angle of 45° with the longitudinal axis of the larva, with the extremity polished horny-black and reaching triangularly back to the middle of the segment. The head is round, flat-faced, somewhat broadly bilobed, shiny black ; the clypeus semi-elliptical, apex rather pointed, centre transversely striate, large ; all parts black. Segment 2 is hood-shaped, the front margin straight between two truncated, cylindrical, dorsolateral, fleshy tubercles. Each segment from 2 to 13 has a central, dorsolateral, fleshy, cylindrical, truncated thinnish tubercle or process ; segments 2, 3, 4 have a similar, much shorter subdorsal one ; segments 3, 4, 5 have a similar and superspiracular one of the same size as the dorsolaterals ; segments 5, 6 and 12 have a small, red, subspiracular tubercle of about half the size of the subdorsals of segments 3 and 4. The dorsolaterals of segment 2 are on the front margin, the subdorsals are mere knobs behind these and there is an indication of a spiracular one, small, in front of the spiracle. The body surface is dull and velvety, the tubercles and front of segment 2 as well as the head are set with very short, sparse, brownish-red hairs. Spiracles oval, shiny black with brownish central slits of ordinary size. Colour : velvety black or dark-green with a dorsolateral row of carmine circular spots, one to each segment 3-11 at the base of the respective dorsolateral tubercles (on the upperside) ; there is also a similar carmine spot at base on the upperside of the lateral tubercles on segments 3-6, 8, 9 and 10 (or where the tubercle should be) ; a similar subspiracular spot on segments 5-12; a cream-coloured dorsal band

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on segments 3-7, narrowing at both ends and flanked by a broad, lateral, similarly coloured band running from the front of segment 2 backwards to meet on the dorsum of segment 8, and continued as a dorsal band on to segments 9 and 10, separated by the segment margins; the bands do not meet in the dorsal line of segment 2 which is black but embraces all the tubercles of that segment which are coloured yellow like it; also a broad, cream-coloured band on segments 11-14 laterally, beginning in a few spots on segment 10 (hinder margin) and finishing about the middle of anal flap on each side of the shiny dorsal extremity; all the tubercles are black except those mentioned above as being otherwise; prolegs shiny black on their outer faces at extremities, dull black elsewhere; true legs shiny black; segments 6-10 soiled flesh colour on venter. The osmaterium is light watery indigo-blue, with the main stem and tips of branches more or less transparent. L: 55mm; B: 11 mm. without tubercles; L. of longest tubercles: 4·5 mm.

Pupa (Pl. I, fig. 13*a*).—The pupa is cylindrical and much resembles a dead bit of stick, broken off short at the top; or, as it is generally attached to a branch, a dead stump of a secondary branch, sticking out at an angle of 45° from the main one. The head end is shaped and coloured so as to give that impression; the whole is rough and coloured to represent dead bark. The hinder end is closely applied along the ventral surfaces of segments 10-13, which are concave beneath to receive the surface of the cylindrical branch it is attached to by the strong, dorsally convex, trapeze-shaped cremaster which is again set beneath plentifully with short, strong, red-brown suspensory hooklets. The whole pupa is more or less perfectly cylindrical between the bevelled anal end and the "broken-off" fore-end; it is, however, slightly broadened out in the middle and is very slightly constricted about segment 4 where the body-band passes over the surface. The vertices of the head and frons have their dorsal line inclined at an angle of 60° to the longitudinal axis of the pupa; segment 2 has that line nearly parallel to that axis and is rather long, with both margins straight; it is flat on dorsum; the thorax rises nearly absolutely perpendicularly from the hinder margin of segment 2 in its first $\frac{1}{3}$, has the hinder $\frac{2}{3}$ at right angles to this, otherwise parallel to the axis of pupa, or very nearly so, very gradually running down and back to segment 4; the dorsal line of segments 4 to 14 is quite parallel to the longitudinal axis; the front declivity of thorax has the surface very rugose with some deep depressions along the front margin; the part of pupa consisting of the vertex of head and frons is oval in shape, broader than high, with an irregular rugose surface limited by an irregular ridge behind in which are two central depressions, one above the other, the anterior one the larger and deeper; the ventral line from front to segment 10 is parallel to longitudinal axis; the shoulders are very slightl prominent and rugose.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The surface of pupa is dull, rugose and pitted all over with slight tubercular risings to mark the position of the larval processes or tubercles; besides which there is a deep, lateral depression stretching from just behind spiracle of segment 6 backwards above spiracle of segment 7, reaching the lateral tubercle of segment 8. Spiracles of segment 2 are indicated by a circular hole, the bottom of which is lost in darkness; the other spiracles are oval, slightly depressed, with a somewhat prominent central ridge. The colour of pupa is lightish-pinkish-brown, washed with smoky black, especially on the dorsal parts where it obscures the ground colour nearly completely with the exception of the subdorsal region of segments 6 and 7; the flat dorsal portion of segment 2 is light yellowish brown, this colour extending to the perpendicular face of thorax in places and to parts of the head surface in front; the wings are dirty whitish sullied with smoky black. L: 38mm; B: 8mm.

Habits.---The egg is laid on a young leaf or bud and is spherical, yellow in colour; the surface is rather rough. The little larva lives on the upper surface of the leaf, seated on a bed of silk, and is brownish oily-looking, with yellowish and orange-brown markings. The final colouring is taken on only at the last moult; the full grown larva sits in the middle of a leaf along the mid-rib---the younger stages also do this. The larva wanders before pupation and voids the whole stomach, skin and all, before actually suspending itself, shrinking much in the process. The silk with which it manufactures the pad and the body-string is quite black; the latter is of medium length and the pupa is fairly rigid from the cremaster upwards owing to the strong tail-fixing. The butterfly is most plentiful during the monsoon months and lies over the dry months in the pupal stage; if the pupa is formed in November it very often does not produce a butterfly until the April or May following. The full-grown larva does not seem to be attacked much by enemies, perhaps due to its warning colours; the young larva, however, is very liable to destruction, mostly, it is supposed, by spiders; it is certainly parasitised less than any other *Papilio* larva. The butterfly, as said, imitates *Euplœa* and *Danais limniace* in its dark and light forms respectively; it even goes so far as to imitate the danaine flight when disporting itself at its ease. It is, however, one of the fastest of all the *Papilios* when it chooses, as when it is alarmed

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and wishes to escape danger or when it chases another insect of its own species in the way of sport. It is fond of circling round the tops of the hills or peaks in the jungles, well above the trees and will keep for hours on the wing under such circumstances, given a warm, fair day in the monsoon months. Half a dozen or so seem to monopolize a particular hill-top, rarely more; and then nearly always the dark form; *dissimilis*, be it from the fact that it is, perhaps, the less common form, does not often join in. It is occasionally present also, but always in fewer numbers. The butterflies sail lazily about most of the time, round and round, in curves and circles, except when every now and again one takes it into its head to chase another and then it is that the quick flight is most noticeable. They dart away, flying often straight up into the sky and are lost to view in a very short space of time; they fly nearly as fast as the larger *Charaxes*, the fastest of all butterflies. Typical *P. clytia* in both forms is found in the Himalayas from Kangra and Simla to Sikhim; Assam; Central and Southern India. It is not by any means a rare butterfly within its limits but may be mistaken for *Euplœa core*, *coreta* or *kollari* or, in the *dissimilis* form, for *Danais limniace* as already remarked. It rests with its wings closed over the back like those insects, though sometimes it assumes the ordinary *Papilio* position of holding them horizontal, the upper slightly covering the lower. It is fond of the sun and is in nowise afraid of facing open spaces; but is confined more or less to the hilly parts of jungle country. The food-plants of the larva are all of the family *Laurineæ*, embracing the Laurels, Cinnamon, and other aromatic-foliaged trees. Some of the species of trees it has been bred on are *Alseodaphne semicarpifolia*, Nees; *Cinnamomum zeylanicum*, Blume; *Litsea chinensis*, Lam. (*sebifera*, Pers.); all three very common in the Bombay Ghats; the first, a very tall evergreen species, found occasionally in deciduous forests also but confined to the western parts of Peninsular India; the last spread throughout the hotter parts of India, Ceylon and, through the Malay Islands, to Australia; the second with a similar distribution as the last except that it is cultivated in the Malay Islands. Cinnamon

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

is easily known by its three-veined leaves and its unmistakeable cinnamon-smell and is one of the prettiest trees in the evergreen jungles where its young leaves sometimes light up large areas with their brilliant reds of all shades from the palest yellow-pink to the brightest crimson.

85. Papilio paris, *L.*—Male *upperside*: black, irrorated with dark-green scales which, on the outer portion of the forewing, coalesce and form an incomplete, postdiscal, narrow band. Hindwing: the irroration of dark-green scales does not extend to the costal margin and is interrupted posteriorly by a broad postdiscal area on both sides of which the green scales coalesce to form narrow diffuse bands; a conspicuous, upper, discal, shining blue patch occupies the base of interspace 4 and outer portions of interspaces 5 and 6; this patch is variable in size and in many specimens extends narrowly below and above into interspaces 3 and 7 respectively, its outer margin is uneven, its inner margin evenly arched; a prominent claret-red, largely black centred ocellus at the tornal angle, its inner margin with a transverse, short, violet-blue, superposed line; in many specimens an obscure, claret-red, subterminal lunule in interspace 7. *Underside*: opaque black; bases of both fore and hindwings up to basal half of cell in fore and up to apex of cell in hindwing, with an irroration of yellowish scales: also present, more obscurely, on the subterminal area in both wings. Forewing with a very broad, elongate triangular, pale area that does not extend to the termen, formed of internervular, broad, very pale, ochraceous white streaks, short near the tornus, gradually longer up to the costa. Hindwing: a prominent, subterminal series of ochraceous red lunules traversed by short violet-blue lines; in interspaces 1 and 2 and sometimes in 3, these lunules are formed into more or less complete, largely black centred ocelli by the addition of an admarginal portion of the red ring. Cilia conspicuously white in the interspaces. Antennæ, head, thorax and abdomen black, the latter three sprinkled with green scales above. Female similar, somewhat paler and duller. *Upperside*: forewing with the green postdiscal band shorter and still more incomplete. Hindwing with the upper discal patch smaller, often green and not blue, the red, subterminal lunule in interspace 7 always present and more prominent than in the male. *Underside*: similar to that of the male, but the tornal and subtornal markings generally formed into more or less complete ocelli. Exp. 106-132mm.

The species does not seem to have been bred. It is found in the Himalayas from Kumaon to Sikkim; Nepal and Bhutan; the hills of Assam, Burma and Tenasserim, extending to China, Siam and the Malay Peninsula. As it is very common in some of the places where it exists in the Himalayas it is mentioned here, being sure to attract attention

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

wherever seen. It does not generally come below 3,000′ above sea level.

86. Papilio tamilana, *Moore.*—Very closely resembles *P. paris,* described above ; but, on the *upperside,* the upper discal patch on the hindwing is of a paler, more metallic blue and very considerably larger ; it extends from interspace 3 well into interspace 7, from the apex of the cell into interspaces 3, 4 and 5 and from the middle of interspace 6 much further towards the termen than in *paris.* *Underside* similar to that of *paris,* but the transverse, postdiscal, pale band on the forewing is conspicuously narrower and curved inwards toward the costa. Antennæ, head, thorax and abdomen as in *paris.* Exp. 116-134mm.

Egg.—The egg is rather small for the insect ; it is perfectly spherical, except that it is slightly flattened where attached to the leaf or stalk or flower bud, &c. It is somewhat shiny, superficially pitted as seen under a lens ; translucent light-green when first laid, soon becoming more opaque and spotted-blotched here and there with brown-red, which colour has a subcutaneous aspect. Diameter : 1· 5mm.

Larva.—In the first stage, on emerging from the egg, it is very like any other larva of the *polymnestor-polytes* group. It is swollen in segments 3, 4, 5 and has the usual dorsolateral long, fleshy, conical spined tubercle on the front margin of segment 2 and on hinder margin of segment 13 ; a smaller one in middle of segments 3, 4, 5, 12 ; a still smaller one in middle of segments 6-11 ; a supraspiracular, very small one on all segments except 13 with the exception of segments 3, 4 where these are as large as the dorsolaterals of the same segments ; the dorsolaterals and supraspiraculars of segment 5 are very little longer than the corresponding tubercles of segment 3 ; besides these there is a subdorsal tubercular spot on segments 3-12 bearing a single, erect hair ; there are also the usual subspiracular, tubercular, hair-bearing spots, as well as one on the base of each leg or in that position of the legless segments. The head is roundish, slightly bilobed, flattish on face, set with erect, short spines all over, shiny black except on vertex where it is greenish-ochreous ; clypeus rather large, triangular. Colour of body is dark olive-green with the dorsa of segments 8-11 ochreous, segment 7 whitish, with three included spots of body-colour arranged in a triangle and with the white reaching on to segment 6 laterally ; dorsa of segments 4, 5 greenish-ochreous ; all tubercles ochreous, those of segments 12, 13 whiter ; the spines of dorsolateral tubercles light, of subdorsal, supraspiracular and subspiracular tubercles black. L : 7mm. ; B : 1· 25mm.

2nd stage.—The larva has all the tubercles of the first stage, but the dorsolateral ones are relatively reduced in size : that is, although the larva is larger, these tubercles are still the same size ; the spiracular spots are also smaller proportionately ; the subdorsal spots remain about the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

same but have lost the spines as have also all the spiracular spots with the exception of those on segments 3, 4, 5 which are, however, now covered with very short, erect hairs. The surface of the larva is covered, not very densely, with minute, erect, light hairs. The colour is very much the same as in the first stage except that the head is now green (and without spines or hairs); the lateral regions of sements 7-10 are obscurely white, spotted about the spiracular area: the prolegs are whitish; the dorsal white marking of segment 7 is more perceptible now where it stretches forward laterally on to segment 6, and there is a dorsolateral streak-continuation backwards on to segment 8; segment 7 has still got the three included spots of body-colour on the white. L: 9mm. towards end of stage, 10mm. at end; B: slightly over 2mm. to 3mm. at end of stage.

3rd stage.—The dorsolateral tubercles of segments 2, 12, 13 still persist, only actually very slightly larger than in last stage; those of segments 3, 4, 5 are mere tubercular spots; the subdorsals of segment 2 are proportionately the same size as in the first two stages and the supraspiraculars of segments 3, 4 are not larger than in last stage; there is no sign of tubercles on segments 6-11 except just an indication of the dorsolateral ones. The head is green with a slight brownish tinge, covered with minute, light-coloured hairs; the eyes are black. The surface of the body is somewhat shiny greasy-looking and is covered plentifully with erect, light hairs so minute as to be only just visible under the lens. Spiracles oval, flush, light brown, of ordinary size. Colour of body is darkish green, somewhat ochreous on segments 2-5, especially on latter half of segment 5, segments 12, 13 and on dorsa of segments 8-11; a distinct white, subspiracular band from segment 7 to segment 10; the white marking of segment 7 reaching up as far as dorsolateral line, occupying the whole width of segment, stretching forward slightly on to segment 6 in spiracular region and backward on to segment 8 in a dorsolateral short line. L: 13 mm; B: 4·75 mm. when at rest.

4th stage.—The dorsolateral tubercles of segments 2, 13 still persist, those of the latter much shortened and blunted; those of segment 12 are reduced to tubercular spots; all tubercles of segments 2-5 exist as in last stage, but are all reduced to spots. Head same as in last stage except that it is greener and, of course, larger. Surface of body dull, except for the shiny tubercular spots. Spiracles rather longly oval, shiny, yellow-brown. Colour of body olive-green spotted with yellow, especially on hinder half of segment 5; segment 6 brighter green; segments 12, 13 nearly completely yellow as well as the tubercles; anal flap and prolegs whitish; white subspiracular band from segment 7 to anal end with the spiracular region above it greyish; marking on segment 7 white, reaching as far up as in 3rd stage, produced forward on to segment 6 as far as, and including, the spiracle, but not backwards on to segment 8. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

osmateria are red-orange in colour. There are light-blue spots where the dorsolateral tubercles of last stage were one to each. L: 20mm; B: nearly 7 mm. when at rest. The larva stretches, when moving, to 25mm.

Last stage.—All tubercles have now disappeared except those on the hinder margin of segment 13, and these even are now reduced to very small, convex, minutely haired knobs; they are situated on the green colour of the upper parts of the larva, just above a yellow line along the hinder margin of the segment; this hinder margin is thickened and is in a plane at right angles to the rest of larva and overhangs the rather large, broad anal flap, which is in a parallel plane to it; this flap is whitish in colour with a square-cut end. The head is nearly round, slightly higher than broad, with a dull surface covered with minute, semi-appressed white hairs; the clypeus is of ordinary size, triangular in shape, with a white linear border and rounded apex; the colour of head is green, the eyes black, the antennæ shiny-translucent whitish. Segment 2 is trapeze-shaped, the front margin slightly longer than the sides, the hinder margin longest; the breadth of body increases rapidly to segment 5/6 where there is a thickening or swelling along the hinder margin of segment 5, not very pronounced, however; after this it decreases gradually to the square end which is practically between the tubercles on hinder margin of segment 13. The surface of larva is dull, smooth and soft-velvety looking. Spiracles are of ordinary size, flush, oval, body-coloured, with white central slit and fine brown border. The colour of the body is a fine bright grass-green, plentifully speckled with yellow, especially on the hinder margins of segments 6-13; with a white, supraspiracular band from segment 5/6 to anal end; an indication of a yellow diagonal line from front margin of segment 8 back and up through the spiracle to the subdorsal region on the hinder margin; below which line the speckling of yellow is absent; on the same region of segments 9, 10 the yellow speckles are grouped into patches to some extent, suggesting bands; the segmental membrane between segments 5, 6 is broadly velvety black, hidden in repose; there is a fine black, supraspiracular line from just before spiracle of segment 2 running back on to segments 2 and 3, above which the body is white, but only for a short space, then yellowish, losing itself in the green of the dorsal parts; the white is continued back in a curve over dorsum along the hinder margin of segment 5 (along ridge) and the green of the dorsum in front of this ridge is speckled white forwards for the distance of half the width of segment; the front of segment 2 is yellowish; there is a long, finely black-bordered area along dorsal line of segment 4, narrow and constricted twice in its length and, on the same segment, a rather small ocellus or eye with a white central dot, just above the supraspiracular white band, contained in the hindermost and lowest loop of a fine black line running, just along the upper border of the white band from the front of segment 3, back to just behind

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

middle of segment 4 (where it loops to contain the eye); thence this line curves up, forming two other loops, towards dorsum to the dorsolateral region where it bends forward towards head of larva for a short distance then down towards venter, making a large open loop over the ocellus and finally runs forwards, parallel to the starting portion, to front margin of segment 3; the starting point of this fine line is connected with the fine black line bordering the underside of the abovementioned white band which, later on, runs along the ridge of segment 5; the part of the body below this white band on segments 2-5, the belly or venter, the anal flap and prolegs are all a very light, rather watery-green with a bluish shade in it. The black band on segmental membrane behind segment 5 is bordered posteriorly by bluish on the membrane. L: 50mm. when slightly stretched, less when at rest, more when moving; B: 13mm. at middle of segment 5, the broadest part.

Pupa.—The pupa is like that of *P. buddha*, the curve of ventral line being very strong, so that the line from centre of ventral line of wings to head is inclined at an angle of nearly 90° to that from the latter point to cremaster; in the dorsal line the angle between the corresponding lines (having their junction in segment 4) is 170°; the thorax is rather short, convex, the lateral outline of the convexity being a curve less than a quarter-circle: there is no suggestion of an apical protuberance to thorax; the head-points are stout, not long, round-topped and compressed dorsally and ventrally, divergent, and slightly separated at base; the lateral outline of pupa from base of head-points is parallel-sided as far as front margin of segment 3, broadening out in a gentle curve to hinder margin of segment 4 where the body-loop or suspending-thread is fixed, and still more again to middle of segment 7 in a stronger curve, whence the outline decreases in breadth to cremaster; the dorsal line of abdomen is only slightly curved; the dorsoventral edge of pupa from shoulder to segment 7 is rather sharp; the constriction where the body-loop comes is laterally strong, dorsally moderate. The cremaster is that of the ordinary type for *Papilio*. The surface of the body is dull, shiny only where the intersegmental membrane is visible, smooth; under the lens it is slightly rugose. Spiracles of segment 2 are indicated by a slightly depressed, small, semicircular space on the surface of segment 2 of a dark-green colour; the other spiracles are oval, raised, rather large, green, with curved, light brown-pink, central slits. The colour of the pupa is rather dark glaucous-green on the wings, light greenish yellow dorsally throughout, light yellowish green ventrally on abdomen; a broad, yellow, dorsal band from cremaster forward to segment 4/5, continued forwards by a brown-pink line as far as front margin of segment 2; dorsoventral edge yellow; a dark dorsolateral spot on centre of segments 3, 5, 8; there is a small dorsolateral depression on segment 2. L: just over 40mm.; B: nearly 18mm. at middle of segment 7; at

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

shoulders: just over 10 mm; at points of head-points: 7 mm; H. at apex of ventral curve: 13 mm.

Habits.—The eggs are laid singly, either on the top of the leaf or on the underside and always, it seems, on leaves of a certain age; sometimes on flower-stalks also. The small larva emerges in the usual way and sometimes eats a little of the egg-shell; then makes a silken nest to lie on near the edge on the upper surface of the leaf; when larger it lies, as is usual with most *Papilio* larvæ, at the point of the leaf, along the midrib, its head directed towards the stalk; it rests with the front segments contracted and the head drawn under segment 2, which makes it look very broad and humped about segments 4 and 5. It pupates in the ordinary way after wandering, but it does not ordinarily wander far; the tail suspension is strong, the body-loop fairly close. As a general rule, it retires high up a tree, often among the flower-stems, and the pupa is always well hidden by overhanging leaves. The imago emerges within 25 days after pupation and is very active, often flying if disturbed before its wings are properly dry. It generally emerges just at day-break. The larvæ are commonest in the months of September and October; in fact it is only at that time of the year that they have ever been found, notwithstanding much seeking in other months. Fully 90 per cent. of the eggs are ichneumoned; the larvæ are much subject to attack from birds, ichneumons, flies, &c. The pupæ often die just before the butterfly emerges.

This is, perhaps, the finest and most striking of all the butterflies likely to be met with in the Hill Stations of the Bombay or Madras Presidencies above 1,000′. It is not found below that level except very occasionally, neither is it found anywhere in the plains, not even along the borders. It is a denizen of the thickest jungles and frequents the evergreens of the hills south of Bombay city. Its distribution is given as "South India; Kanara, Malabar; Nilgiri Hills" by Rothschild, and Colonel Bingham adds "Travancore." It is plentiful in the District of North Kanara from the sea-shore (the hills come down to the sea in places) inwards, especially so in the monsoon months when, in favourable places, as many as half a dozen may be seen on the wing at

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

once. The insect is fond of the evergreen jungles as already remarked and there it delights to fly in the intervals of hot sunshine along roads, paths and the borders of clearings; it rises high amongst the tree-tops but often descends to within a few feet of the ground on the edges of openings and summits of hills where the jungle is more or less scrubby, flying with a rather weak wing-stroke but in the ordinary *Papilio* manner, stopping at an occasional flower to feed, circling round the foliage of shrubs surrounding its food-plant or diving down into dark nallas over rippling streams to emerge again into sunshine on the other side. This is true of the male, but the female, curiously enough, is rarely seen. Curiously enough, because, in breeding from the caterpillar, rather more females are obtained than males. Probably the female attends more diligently to business while the other sex sports about in the intervals of courtship, like most inferior masculine creatures. During some ten years of collecting, only two females were caught as compared with dozens and dozens of males; and one of these had only just emerged from the chrysalis for its wings were hardly ready for flight; the other was captured sitting on a leaf by the roadside in the characteristic position with the forewing hiding the brilliant peacock-blue spot of the hinder one. In those days a female *tamilana* was a red-letter event, for the larva had not been yet discovered. And that was not for want of searching either. The history of the search and final discovery after twelve years would afford an excellent example of the difficulties sometimes experienced in learning the life-histories of insects. The food-plant of the larva is *Evodia roxburghiana*, Benth., a moderate sized tree growing in the evergreen forest regions of the Western Ghats south of Bombay. It belongs to the *Rutaceæ* and the leaf has the characteristic smell belonging to that family of plants; the flowers are small, arranged in many branched bunches from the axils of the leaves, plenty of them when the tree is in flower at the end of the monsoon; the leaf is rather large, soft, divided into three leaflets, the whole with a long stalk. *Evodia* as a genus is found throughout India in the hills and extends through Burma to the Malayan Region and Australia.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Butterflies that bear a resemblance to *paris* and *tamilana* are some forms of *P. bianor*, Cram. from China as *P. maacki*, Men., a green-suffused form of the typically black *bianor*; *P. polyctor*, Boisd. from Cashmere, Afghanistan and Nepaul and its race *P. ganesa*, Doubl. from Sikkim, Assam, Tonkin, both with the green-blue patch on hind wing developed; *P. arcturus*, Westw. and *P. krishna*, Moore, both from Assam and Sikkim, both very like *paris* but having the green patch more circumscribed; and *P. arjuna*, Horsf. from Java and Sumatra.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BIRD NOTES BY THE WAY IN KASHMIR.

BY

MAJOR H. A. F. MAGRATH.

A short trip, much favoured of tourists in Kashmir in July and August, and one which has perhaps often been described, is that from Pahlgam, the well known camping resort in the Liddar Valley, to Sonemurg in the Sind Valley *via* the Yem Her Pass (14,000 feet). To the field naturalist or ornithologist, who undertakes it for the first time, this trip is full of interest, for, except in the vicinity of the pass, the parts he traverses are perhaps the most "birdie" bits in Kashmir. Among my various rambles in Kashmir this year (1911) this was perhaps the most enjoyable.

My leave did not commence till the middle of July and when I arrived in the Liddar Valley the breeding season was approaching its close. Owing to the absence of rain or storms of any severity this summer the season appeared to be a most successful one and young fledglings were to be seen everywhere. Warblers (*Phylloscopi* and *Acanthopneuste*) simply swarmed in the forests and many other kinds of birds were in great abundance, notably the following species :—

The Crested Black Tit (*Lopophanes melanolophus*).
The Himalayan Whistling-Thrush (*Myiophoneus temmincki*).
The Kashmir Wren (*Anorthura neglecta*).
The Himalayan Tree-Creeper (*Certhia himalayana*).
Brook's Nuthatch (*Sitta kashmiriensis*).
The Sooty Flycatcher (*Hemichelidon sibirica*).
The Whitecapped Redstart (*Chimarrhornis leucocephalus*).
The Plumbeous Redstart (*Rhyacornis fuliginosis*).
The Dark Grey Bushchat (*Oreicola ferrea*).
The Indian Bushchat (*Pratincola maura*).
The Eastern Meadow Bunting (*Emberiza stracheyi*).
Hodgsons Pied Wagtail (*Motacilla hodgsoni*).
The Himalayan Pied Woodpecker (*Dendrocopus himalayensis*).
The Common Sandpiper (*Totanus hypoleucus*).

Pahlgam itself is full of bird-life in summer and there were many inducements to halt so I stayed here till past the middle of August. On the Liddar stream at this place I was fortunate in coming across the Ibis-bill (*Ibidorhynchus struthersi*), a bird new to me. There were four or five frequenting a shingly bit of the river bed below the visitors camping ground which I felt sure were a pair with a fully fledged brood. If hatched in May the young would have been, at most, fully grown by the time I met with them. In habits the Ibis-bill differs little from the Sandpipers and allied waders, but in some it approaches the plovers. In the evenings they were often to be seen feeding and probing for worms on the short grass by the river during which they would run for a few steps and then stop much

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as the plovers do. When watching them one morning I also noted a rather characteristic and almost "cincline" habit of wading breast high into fast flowing water and dipping the whole head and neck under water, picking up food of sorts from the bottom. The Sandpipers act similarly, but not in such a dipper like manner and in such heavy water. I was much disappointed in not hearing any notes from these birds, but if they uttered any low notes in my presence, these were entirely drowned by the roar of the stream. On one occasion I thought I heard a loud monosyllabic whistle from one of the birds flying down stream, but there were such a lot of Kashmiris about herding ponies and cattle, an occupation which appears to necessitate a lot of whistling, that I could not be positive the sound proceeded from the Ibis-bill. Females or at any rate the young do not appear to have any black on the face.

A little bird not uncommon in the middle Liddar and Sind Valleys this year and one which I had not noticed, on a previous visit to these parts, was the handsome Indian redbreasted Flycatcher (*Siphia hyperythra*). Its habits are precisely those of its european congener (*S. parva*) and it has the same vigorous jerk of the tail above the line of the back.

Another flycatcher, fairly common in the same parts as the last species, was the Rufous-tailed Flycatcher (*Alseonax ruficaudus*).

Unlike *Muscicapa*, and *Hemichelidon* and other genera of the family this little flycather rarely if ever returns to the same perch after catching its prey, but flits from branch to branch in doing so. If *S. hyperythra* flies into the tree where *A. ruficaudus* is hawking the latter drives the former out.

Leaving Pahlgam on the 18th August Liddarwat, the road to which lies through lovely scenery, was reached in 2 easy stages. Half way at Aru (8,300 feet) I saw a pair of Rufous-backed Shrikes (*Lanius erythronotus*), a record elevation, as far as my observations go, regarding this species. I may here observe that the note of anger or indignation which this shrike is not infrequently heard uttering from the middle of a thick shrubor tree especially in the breeding season has recently struck me as bearing a very close resemblance to the note of the Corncrake (*Crex pratensis*) heard in the distance.

At Liddawat 9,500 feet above the sea and 2,000 feet higher than Pahlgam, the woods were teeming with bird-life.

Two interesting species met with were The Orange Bullfinch (*Pyrrhula aurantiaca*) and The Red-browed Finch (*Callacanthis burtoni*).

The former is not very uncommon in this part of Kashmir and after once getting to recognise its notes I became well acquainted with it. This beautiful little bulfinch has much the same habits as our home "bully," and a somewhat similar loud piping call note. A note of communication kept up while feeding is soft and pleasing, resembling the syllable "tew" and often changing to a double note like "tĕwtyă" "tĕwtyă." What was evidently the song or part of it I heard at Sonemurg. A most distinctive

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

one, it commences with the aforementioned syllable "tew" uttered in a loud and melodious tone followed by a rapidly repeated metallic trisyllabic note like "tyătlĭnkă-tlĭnkă." The Orange Bulfinch must be a late breeder for a male I shot on 19th August had the testes as big as No. 2 shot and I almost invariably found these birds in pairs. On one occasion only was their a young bird with a pair. Colonel Ward's Collectors, I believe, took eggs and found nests late in August. I generally met with this species just in or on the edges of forests and often feeding on the catkins of the Himalayan birches. 10,500 feet was the maximum elevation at which they were seen but they probably wander on occasions up to tree limit.

The Red-browed Finch (*Callacanthis burtoni*) was not uncommon between 9,000 and 10,000 feet at Liddarwat and at the same elevation in the Sind Valley. The position accorded this genus in the family is somewhat puzzling to comprehend. In the straightness of the bill and to some extent in plumage it may have affinities with *Carduelis*, but in the thickness and heaviness of the former it certainly can have none, neither, as far as my observations go, has it in habits. To me the latter appear more akin to those of the Grosbeaks. It hops about the forest undergrowth picking up seeds in just the same assiduous manner as The Black and Yellow Grosbeak (*Pycnorhampus icteroides*). But from *Pycnorhampus* as well as *Carduelis* and unlike most other members of the family it differs in being, as far as I have noted, solitary or non-gregarious, for I invariably met with these finches in pairs or singly. Forest and often dark forest appears to suit their tastes and in such situations I generally found them feeding on seeds of a succulent undergrowth and not particularly resenting my presence. When startled they flew into the nearest tree and remained not at all shy, eyeing one inquisitively.

A bird shot at Liddarwat on 20th August had the testes as big as No. 2 shot. This was one of a pair, and the behaviour of the female on her mate being killed, was precisely that of a female crossbill (*Loxia curvirostra scotica*) which lost her mate in similar circumstances in Scotland last year. She hovered over the spot reiterating a loud and very plaintive double note resembling the syllables "twêeyeh' (the 1st syllable pitched highest) and following me for some yards in the branches overhead after I had picked up and carried away her dead mate.

The ordinary call note of this species is a loud and pretty "twee," occasionally a loud double song note like the syllables "üh-eh" (the second pitched a ½ tone higher) is uttered. At Sonemurg one day after watching and listening to a male, who shortly disappeared among the branches, I shot a missel thrush (*Turdus viscivorous*), which not being kille doutright, uttered loud screams as it fell fluttering down the forest hillside. Immediately a Red-browed Finch, undoubtedly the one I had been observing, together with another, probably its mate, appeared in a tree overhead and both utter-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ing the "üh-eh" note—a denunciation which made me feel duly contrite!

In flight this finch reminds one of *Loxia*. The freshly killed female has the supercilium a bright orange yellow, borders to the anterior feathers of the occiput, dull orange yellow and the forehead a dingy yellow.

Striking up north-west from Liddarwat to the Yem Her Pass the hill-sides are devoid of trees, but the open slopes from 10,000 feet and over are carpeted with flowers of various kinds and hues, docks, thistle and weeds, etc. Among this luxurious and knee-deep herbage large parties of Tickell's Willow Warbler (*Phylloscopus affinis*) were to be seen feeding on the numerous small flies and aphides adhering to the plant heads.

From 11,000 to 13,500 feet. The Blue-fronted Redstart (*Ruticilla frontalis*) was not uncommon. This Redstart appeared partial to rocky moraines near streams. It does not shiver* the tail, but flirts it vertically once or twice like *Chimarrhornis leucocephalus*, though not so vigorously as the latter.

A greyish robinlike bird seen in the distance on a moraine was, I have little doubt, a Himalayan Ruby throat (*Calliope pectoralis*).

The presence of the Grey Wagtail (*Motacilla melanops*) at 12,000 feet and over surprised me. This graceful wagtail was ubiquitous and abundant in Kashmir this year. A habit of the species, noticed both in Scotland and the Himalayas, is feeding, at times, in woodland and dry places often some hundreds of yards from water.

Below the Yem Her Pass, on the Liddar side, the stream issuing from a small glacier runs over a flat stretch and has formed a marshy tarn. Off this at 13,500 feet I put up a small wisp of green sandpipers (*Totanus ocropus*) and a greenshank (*T. glottis*).

Numerous Marmots (*Arctomys caudatus*) had their burrows in the hill-sides round this tarn and the shrill cries† and strange aspect of these big rodents were a source of vast excitement to my terrier.

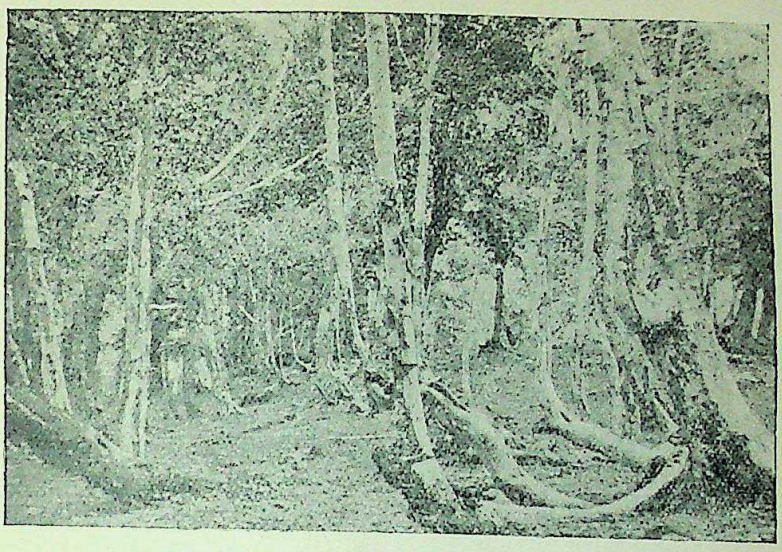
Once over the Pass the track after a steep drop runs along bare but grassy hillsides and then descends through beautiful forest to the Sind Valley. In the forest I found the Spotted Nutcracker (*Nucifraga multipunctata*), common as indeed it was all along to Sonemurg. This bird, contrary to the impression it first gave me in the Hazara Hills, is not at all shy, and is often most inquisitive. The note is harsh and magpie-like and could be well imitated by two or three rapid twirls of a child's wooden toy ratchet. It usually affects forest, though I have seen a pair well in the open. It however has to come into fairly open parts to feed on the walnuts that grow along the Sind river and to which it is partial.

* The only species of this subfamily that I am acquainted with that vibrate the tail are *Ruticilla phœnicurus* and *R. rufiventris*. It would be interesting to have a list of the members of the *Ruticillinæ* which shiver or vibrate as opposed to flirt and wag the tail.

† It can hardly be correct to talk of the Marmots "whistle" as so many writers do. A whistling Mammal, apart from man, somehow does not sound congruous!

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Sonemurg—A bit of Woodland.

At Sonemurg* (9,000 feet) the scenery, in this most delightful of summer camping resorts, was charming and impressive. Bird-life was abundant, and as usual young birds of the year were much in evidence. A feature of this bird-life was the chough (*Graculus eremita*), a handsome member of the *corvidæ* with its blue black plumage and brightly coloured bill and legs. Its caw is jackdaw-like, though squeaky, and various shrill squeaky notes are uttered that can be heard at a great distance. Often these notes produce a curious effect, especially when uttered in the air, for they deceive one into imagining that they proceed from some bird in a bush close by till one discovers that some black specks high in the blue are responsible for the sounds. When the breeze is strong—(in Sonemurg breezes often are strong)—the chough is fond of gambolling high in the air.

The Jungle Crow (*Corvus macrorhynchus*) also occurs in some numbers, but it was noticeable that, when occasionally it fed in flocks on the open "Murg" like rooks, the Chough, which does the like habitually, never associated with the crows.

Once I saw a flock of Jackdaws (*C. monedula*) on the "Murg," a high elevation for this species as it is low for the Chough in summer. But the Jackdaw becomes a great wanderer after the young are fledged in the

* For the benefit of those who do not know Kashmir, I may state that the word "Sonemurg" means "The golden Meadow." The name probably originated in the mind of some poetically inspired Kashmiri, who was impressed by the profusion of yellow *ranunculæ* (species of butter-cups) and ragwort which covers the open downs or "Murgs" between the edge of the forest and the river in summer.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

vale of Kashmir, where it breeds so abundantly, and flocks proceed to considerable elevations up the mountain valleys.

Though mountain torrents pour down from numerous glaciers round Sonemurg, it was surprising in what appeared such a suitable environment, not to find. The Western Spotted Forktail (*Henicurus maculatus*), possibly the bird had descended to lower elevations after breeding. The only representative of this group seen was The Little Forktail (*Microcichla scouleri*) and of it only a single pair were observed on one occasion.

An example of Hodgson's Shortwing (*Hodgsonius phœnecuroides*) seen one day was another species new to me. The way this bird cocks its long tail at an acute angle to the body makes it look like some overgrown wren, but its habits, otherwise, unmistakably proclaim it a member of the *Crateropodidæ*.

Jerdon's Accentor (*Tharralœus jerdoni*), a handsome little bird, was not uncommon. This and the preceding species are skulkers in thick undergrowth, though the former is the worst delinquent in this respect.

Red-flanked Bush-Robins (*Ianthia rufilata*) were numerous, especially young birds, as also at Liddarwat. A ready means of identifying the young, in places where this species is likely to occur, is by their habit of flirting or rather flicking the tail from the line of the back downwards, never elevating it above that line. This little bird has a ruticilline scolding note and is a true robin in habits.

It was homelike observing the Missel Thrush (*Turdus viscivorous*) in such numbers. This Thrush, as doubtless other observers have noted, becomes quite gregarious after breeding time, and during the autumn months. Flocks of 20 birds or more were not uncommon, both here and in the Liddar Valley. I have noted the same thing in Scotland and Ireland at this season. One flock in Sonemurg was in the habit of visiting a certain spot, on a mountain stream running through forest, for bathing purposes, and for several days in succession one could always count on finding the birds at their ablutions if the place was visited about 6 p.m.

One day while crossing a snow slope, below a glacier at about 11,000 feet, a pair of wagtails alighted on the snow beside me. I noted them down as "masked wagtails" (*Motacilla personata*), both being grey on the back, though they may have been *M. hodgsoni* in immature plumage, as this wagtail occurs on the "Murg" lower down. These two species in winter and immature plumage are terribly difficult to separate. In any case it was a curious spot to meet with a wagtail of either species.

Higher up I was surprised to find the Kashmir Martin (*Chelidon kashmiriensis*) hawking over the snow. The birds evidently were, or had been, breeding in the cliffs around. A cold forbidding spot for the purpose for such an usually confiding species.

In my rambles above tree limit at 11,000 feet and over, I had hoped to meet with, especially at the time of year, more than one species of Mountain Finch, but the only species observed here and in the Liddar,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

was Stolickzka's Mountain Finch (*Fringillauda sordida*). The young of this species are much handsomer than the adults, the head being dark chestnut, the feathers of the mantle, scapulars, and wing coverts dark centred and bordered by rich fulvous. The irrides are apparently a nut brown or hazel not "carmine" as in the adult. This lark finch has a very sparrow-like chirp. It was common from 9,000 to 13,000 feet.

The White-Capped Redstart (*Chimarrhornis leucocephalus*), as before mentioned was noted as abundant, but more especially was this the case along the Upper Sind and its tributaries around Sonemurg. The "Fauna" hardly lays enough stress on this handsome redstart's aquatic habits. As Dresser puts it in his "Manual of Palaearctic Birds:" "The White-Capped Redstart in its general habits has much in common with the waterousel."

Glaciers, Sonemurg.

The Brown Dipper (*Cinclus asiaticus*) always afforded me intense pleasure in watching its aquatic performances. The seething turmoil of water this dipper will face, thrashing its way below the surface and appearing a foot or two higher up than where it dived is truly marvellous. Even this redoubtable diver is sometimes carried away by the stream. But it seems to be able to cling like a limpet to the first boulder it is brought in contact with, on to which it quickly scrambles out of harm's way, bobbing serenely, and seeming to relish these little escapades.

Returning to camp one evening a pair of Goldfinches (*Carduelis caniceps*) flew into a tree close by me and thence descended to drink at a stream The only examples of this species seen in Sonemurg, though lower down the Valley they were commoner.

The loud "Treeka," "Treeka," note of the black and yellow Grosbeak

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

was often to be heard in the forests, though the birds seldom showed themselves. The note of this species is not always a safe guide as to the birds abundance or otherwise, as one bird can make enough noise for 20 of another species.

Compared with Hazara this Grosbeak was not common.

On the lower "Murgs" sparse crops of pulse and barley are cultivated. Here buntings and finches congregate in considerable numbers to feed, and here, I came across three examples of the common sparrow *Passer domesticus*—a bird it never gives me pleasure to meet with—but as the Sind valley lower down is cultivated to within eight miles of Sonemurg, the sparrow's presence in summer is perhaps not surprising even at this elevation.

I may here remark that two races of *Passer domesticus* are observable in Kashmir. One the common sedentary sparrow of Indian towns and villages, the other a migratory race that breeds up to 6,000 or 7,000 feet in the N.-W. Himalayas, the hills of N.-W. F. Province, Afghanistan and perhaps further west, and that winters, I imagine, in the Central Provinces, Dekhan, and may be, further south. This migratory race in its northward migration follows the ripening of the crops in the Punjab and N.-W. F. Province, and as Capt. C. H. T. Whitehead has shown in his paper on "The Birds of Kohat and Kurram," appears in association with *Passer hispaniolensis* and *Pastor roseus*, the enormous flocks comprising these three species doing devastating damage to the corn crops *en route*. It is this migratory race which is so strongly represented in Kashmir in Summer. It differs from the village sparrow in being more richly coloured, the back and scapulars being bay rather than chestnut, and it is, I think, a slightly larger bird. It generally breeds in holes in chenaars and willows and often at some distance from villages, though it avoids forests, being replaced therein by the chestnut headed sparrow (*Passer cinnamoneus*).

Before I left Sonemurg on 3rd September migration, though not strongly marked, had set in. The following species, evidently on their passage down from higher, colder and more northerly regions, were observed.

A blue throat (*Cyanecula*), species not determined as, owing to the thick cover in the crops, the bird would not give me a chance to shoot it.

The common Rose Finch (*Carpodacus erythrinus*), *common*.

The Red-headed Bunting (*Emberiza luteola*) a few.

The Tree Pipit (*Anthus trivalis*) abundant, and the only Pipit, as far as I could see, in the place. I should have expected to meet with *A. maculatus* rather than with this species, especially in such numbers.

The shooting season was now about to open, and the "call" of snipe, duck and chikor was insistent, but it was not without regret that I bid farewell to Sonemurg, its birds and scenery, to follow more exciting, if less interesting pursuits in the vale of Kashmir below. I hope to revisit these parts, next time in the breeding season.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A LIST OF INDIAN BUTTERFLIES.

BY

CAPT. W. H. EVANS, R.E.

During the last few years a good deal has been written on the butterflies of India including several works of great importance; unfortunately the views of the various authorities are at variance on many points and in order to arrive at a correct conclusion it is often necessary to search through numerous publications in different languages.

Nothing original is claimed for the list here produced; it is the result of many days spent at the British Museum, some thirteen years of assiduous collecting in nearly every part of India and a careful study of all that has been published during the last 20 years on the butterflies of India and neighbouring countries. A Government servant cannot of course devote as much time to a subject of this nature as the man of leisure or the professional naturalist is able to, but I think it only fair to claim that one who has watched insects in their natural state can often produce evidence regarding them that is out of reach of the man who only sees the same insects in a cabinet.

I have no doubt that this list is far from perfect and I hope that Indian collectors will point out any errors as well as communicate the results of their experience in the Society's Journal. A good collection at Bombay would be of great assistance to collectors; the Society requires specimens, with dates and localities, of practically every form from every part of India. Separately printed lists with the remarks and synonyms omitted can be obtained from the Honorary Secretary; the list ought to prove of assistance in labelling collections, making exchange lists, etc.

The more important sources of information on Indian butterflies are as follows:—

(i) De Nicéville's "Butterflies of India, Burmah and Ceylon" published from 1884-1890, and completed to the end of the Lycænidæ. This was for some time the standard work and even now its wealth of detail renders it of the greatest use to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a student; since its publication, however, many new species have been discovered, certain changes of arrangement due to increased knowledge have been found necessary and the system of dividing species into local races has been matured.

(ii) Moore's "Lepidoptera Indica" begun in 1890 and completed by Col. Swinhoe nearly to the end of the Lycænidæ. It is a magnificent work, each insect being fully described and figured; its price unfortunately puts it beyond the reach of most collectors in India. The general arrangement is similar to that adopted by De Niceville, but in details there is a great difference; large comprehensive genera are split up into several new genera and in many cases numbers of new species are formed out of what had previously been regarded as a single variable species.

(iii) Bingham's "Butterflies" (Fauna of India), the first two volumes to the middle of the Lycænidæ issued in 1905 and 1907; the third and fourth volumes being completed by Mr. H. Druce. Drastic, perhaps too drastic, treatment is here meted out to many of Moore's genera and species; many hitherto supposed species are placed as local races or sunk as synonyms or mere varieties.

(iv) Seitz "Macrolepidoptera of the World" by various German naturalists, begun in 1906; the palæarctic portion is completed, the Indo Malayan section has got as far as the beginning of the Nymphalinæ, the Papilionidæ, Pieridæ, Danainæ and Satyrinæ being completed. This is an excellent and reasonably priced work of reference with a coloured figure of nearly every species; the descriptions, however, are very meagre. The numbers of actual species are considerably reduced but many new local races and varieties are introduced while in many cases names have been given to seasonal forms. The general arrangement differs somewhat from that adopted by English authors.

(v) Elwes and Edwards "Revision of the Oriental Hesperiidæ," 1896, based on Watson's "Key to the Indian genera of Hesperiidæ" issued shortly before. This monograph gives

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

keys to aid in the identification of species and results of the study of the male organs.

(vi) Other important works are :—

(*a*) Rothschild and Jordan's "Revisions" of the Oriental Papilios and Charaxes (Nov. Zool., 1895 and 1896) based on the male organs; the principle of denoting a local race by a second name is here introduced.

(*b*) De Niceville's "New and little known Indo Malayan butterflies" appearing in this and the Asiatic Society's Journal from 1889 to 1901.

(*c*) Bethune Baker's "Revision of the Amblypodia group," 1903, based on the male organs.

(*d*) Chapman's "Review of the genus Lycænopsis" (= Cyaniris), 1908, based on the male organs.

(*e*) Verity's "Rhopalocera Palæarctica," a French work with good figures and plenty of detail; at present only the Papilionidæ and Pieridæ have been completed.

In this list an attempt has been made to correlate the works of Seitz, Bingham and Moore on the basis described below.

The general arrangement given by Bingham has been followed. Seitz differs in placing the Papilionidæ and Pieridæ first. Moore and Seitz have further subdivided some of the sub-families into groups, but as these groups are often more artificial than natural and run into each other, there seems to be no advantage to be gained by their employment. Theclinæ is restricted to the Thecla-Ilerda group and Deudoriginæ introduced for the rest of Bingham's "Theclinæ": the Lycænid sub-families are not very satisfactory. Ismeninæ is here used for the Ismene group is the Hesperiidæ.

The most natural arrangement of genera is in the form of a genealogical tree and consequently a linear method can never be satisfactory. Bingham's order of genera has been followed with the exception of the Satyrinæ, where Seitz's arrangement has been adopted; the position of Cethosia and a few other genera have been changed. Aphnæus has been placed next Chrysophanus, as in Palæarctic territory these two genera are closely allied. The Deudoryx and Camena groups have been brought together.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

As regards the genera themselves Bingham and Seitz agree fairly well and where they differ, Seitz, who reviews the butterflies of the world, has usually been followed. Many of Moore's genera have been used as sub-genera; genera are thus rendered more comprehensive and natural groups within them kept separate.

The word "species" has been a source of much contention and Bingham substituted the word "form" for it, an indefinite term meaning anything from a species to a slight variety. The matter does not seem to present any great difficulty as long as it realised that a local race may develop into a species and eventually into a genus, that no hard and fast rule is laid down and that this development may be encountered at any stage. For ordinary purposes a species may be defined as a group of individual forms that resemble one another more or less and are capable of freely interbreeding with one another but normally refuse to breed with any other species.

A species spread over a wide area may develop into a number of more or less well defined local races and more especially so if geographical obstacles intervene. Migratory species like the Catopsilias and Polyommatus bœticus are always intermixing, thus preventing the formation of local races. Weak flying hill species separated by intervening plains are almost certain to develop into races and perhaps eventually into new species; thus the Nilgiri Colias is a race of the Himalayan Colias lativitta which itself is a race of the European Colias hyale.

A local race may eventually develop into a species, but when a race actually becomes a species it is impossible to say. Many entomologists affirm that if the male organs of two forms are alike they are conspecific and *vice versa*, if the male organs differ they belong to two species; this does not seem to follow necessarily and the only real test would be to put several individuals of one race with several individuals of another race and watch if interbreeding occurred. In many instances grading between races is apparent where the boundaries of their respective areas meet, but where some geographical obstacle intervenes this is impossible.

It is assumed here that where two forms inhabiting separate areas resemble each other fairly closely, though differing in certain

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

respects, they are races of the same species: also no two local races can fly together. This latter statement was not accepted by Col. Bingham, who, for instance, placed *Ypthima ceylonica* as a race of *hübneri*, in spite of the fact that they fly together and that, as had been pointed out by Elwes, their male organs differ. Dr. Chapman also considers that *Cyaniris huegeli* and *cœlestina* are conspecific, though flying together, as their male organs are alike: of course, this may be a case of dimorphism and the question can only be settled by breeding experiments.

There is at the present time a tendency to multiply local races, and the difficulty is to know where to stop: often in mountainous districts, forms from neighbouring valleys differ and a change of elevation may produce a marked effect. Where sufficient material has been available in the B. M., I have carefully investigated the merits of every local race described up to the time of writing: where there was no visible difference to be detected the race has been sunk as a synonym.

A species or race is subject to variation in a number of ways as follows:—

(*a*) Seasonal forms due to climatic changes during the year. In some species the differences are very small, in others as *Erebia annada* there is a sharply marked change, while in others again as *Terias hecabe*, though the extreme forms are very different, yet intermediate forms connect them by an almost insensible gradation. To name seasonal forms, as done by Seitz, seems a mistake: it would be better to designate them as d. s. f. and w. s. f. (dry or wet season form) or f. vern. and f. aest. (spring or summer form).

(*b*) Dimorphs occur in a few species being oftener confined to the female sex. True dimorphs are frequently occurring forms unconnected to the normal forms by intermediates. They are best designated by a Latin name with the prefix "d" and also "♂" or "♀" if confined to a particular sex.

(*c*) Varieties are forms frequently occurring with the normal form, differing from it in certain particulars, but connected by intermediates. What varieties should be named is a standing *casus belli* among entomologists. With highly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

variable species as occur in the genera *Kallima* and *Melanitis* it would be ridiculous to name every variety and the same might be said of *Terias hecabe* and *Charaxes hierax*. To ignore all varieties would be wrong, but where the limit is to be placed must always remain a matter of opinion. In this list well marked varieties of species that are not inordinately variable are included and designated by the prefix "v," the sexual sign being added where necessary.

(*d*) Hybrids are rare in nature, though of not infrequent occurrence in the genus *Colotis*: they are not, as a rule, worth naming, and the only one given here is *Colias chrysodona*, generally regarded as a hybrid between *C. erate* and *fieldii*.

(*e*) Aberrations are due to some abnormal condition and are of infrequent occurrence; they differ more or less from the normal form and are not connected with it by intermediates. They are not worth naming though in many cases this has been done.

In the past many a new species has been described from a single specimen with unfortunate results: it would be better, as a rule, to consider any possible new form as an aberration until more specimens are obtained: it should then be considered whether it is a variety or seasonal form of an already known form flying in the same district: next the question of it being a local race of a species in some other area should be investigated; only when these steps have been completed should the possibility of it being a new species be considered.

A full synonymy has not been given except for the *Hesperiidæ*; changes of nomenclature, etc., are pointed out in the notes. Some new forms about to be described by Maj. Tytler have been included.

The following new sub-genera, species, races, etc., have been described:—

Satyrus hübneri *moorei*. Ypthima (*shania*.) Mycalesis perseoides *khasia*. M. visala *orcha*. M. lepcha *watsoni*. Apatura ambica *chitralensis*. Sephisa chandra ♀ d. *chandræna* and ♀ v. *albina*. Euthalia garuda *diversa*. Neptis columella *kankena*. Neptis *melba*. Argynnis hyperbius *hybrida*. A. jainadeva *pallida*. A. aglaia *ashretha*. Melitæa sindura *balba*. M. trivia *mixta*. Papilio polytes ♀ d. *stichioides*. Papilio

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(*Mimbyasa*). Aporia nabellica *hesba* Pieris canidia *canis*. Colotis amatus, ♀ *d. albina*. Lycæna orbitulus *walli*. Lycæna (*Tiora & Bryna*). Lycæna sebrus *shandura*. L. devanica *gracilis*. Lycænesthes emolus *topa*. Ilerda androcles *viridis*. Arhopala ganesa *watsoni*. Parnara (*Milena*).

LIST OF ABBREVIATIONS USED FOR LOCALITIES.

As. = Assam.

An. = Andaman.

Bhut. = Bhutan.

B. = Burma.

Bal. = Baluchistan.

C. = Ceylon.

Chit. = Chitral.

Centr. = Central India.

C. P. = Central Provinces.

Him. = Himalayas.

I. = India generally.

Kash. = Kashmir.

Kan. = Kanara.

Kum. = Kumaon.

Lad. = Ladak.

L. B. = Lower Burma.

Muss. = Mussoorie.

N. I. = North India.

Nil. = Nilgiris.

Ni. = Nicobars.

Sik. = Sikkim.

S. = South India.

S. B. = South Burma.

Ten. = Tenasserim.

S. Ten. = South Tenasserim.

W. H. or W. Him. = Western Himalayas.

E. H. = Eastern Himalayas.

Up. B. = Upper Burma.

Up. As. = Upper Assam.

Trav. = Travancore.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		DANAINÆ.				
Hestia ..	(Hestia) ..	jasonia, Wd.	....	C.	.....	Fruhstorfer's arrangement has been adopted for the Danainæ, a few more of Moore's subgenera having been used in Euplœa.
			malabarica, M.	S.		
			kanarensis, M.	Kan.	.....	
			agarmarschana, Fd.	Ten.	.....	
			arrakana, Fruh.	Arrakan, Up. B.		Arracana is a good race intermediate between agarmarschana and cadelli; margherita I have not seen, but Upper Burma specimens are arracana.
			hadeni, W.M. & De N.	Bassein.	.....	
			margherita, Fruh.	Up. As.		DeNiceville gives Ideopsis deopsis (Gamana) Daos, Bdl., from India stating that it has been bred on the Tenasserim coast; no author since has included it amongst the Indian butterflies.
Danais ..			cadelli, W. M. & De N.	An.		
	(Nectaria) .	hypermnestra.	linteata, But.	S. Ten.		
	(Radena) ..	similis ..	vulgaris, But.	B.		
			exprompta, But.	C.		
			nicobarica, W.M. & De N.	Ni.		
	(Parantica).	aglea, Cr.	....	S. C.		
			melanoides, M.	Kash.—B.	Fruh as grammica, But., usually put as=aglea. Fruh separates Ten. race as phormion.	
			melanoleuca, M.	An.		
		eryx ..	agleoides, Fd.	B. Ni.	Fruh "eryx=agleoides."	
	(Ravadebra).	aspasia, Fab.	....	S.B.	=crocea, But.	
	(Chittira)..	fumata, But.	....	C.		
		nilgiriensis, M.	....	S.		
		melaneus, Cr.	....	Sik.—B.	=plateniston, Fruh ("melaneus, China").	
		tytia, Gray.	....	Kash.—B.	Fruh "W. Him. race=sita koll."	
	(Tirumala).	gautama, M.	....	B.		
			gautamoides, Doh.	Ni.		
		limniace, Cr.	...	I. B. C. Ni.	Fruh separates C. race as mutina.	
		melissa ..	septentrionis, But.	N. I. B.		
			dravidarum, Fruh.	S.		
			musikanos Fruh.	C.		
	(Salatura)..	plexippus, L.	....	I. B. C. Ni.	nepalensis, M. a cas ab.	
	melanippus.	indicus, Fruh		Beng.—B.	hegesippus, Cr., Malay Peninsula.	
			nesippus, Fd.	Ni.		
		chrysippus, L.	....	I. B. C. An. Ni.		
			(d. dorippus, Cr.).	....		
			(v. alcippoides, Cr.)	....	alcippus, Cr., Africa.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Subgenus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
NYMPHALIDÆ. —*contd.*		DANAINÆ.—*contd.*				
Euploea ..	(Crastia) ..	modesta, But.	....	B.	... ..	
			.....	S. Ten.		
		camaralzaman, But.	bremeri, Fd.	Ten.	? Indian race = olivacea, M.	
		crameri ..	frauenfeldii, Fd.	Ni.	=esperi, Fd. biseriata, M.	Regarding frauenfeldii, this name was given to an insect said to have come from Ceylon; esperi and biseriata were described as two exactly similar insects from the Nicobars, the former having and the latter lacking the Male brand. Fruhstorfer following De Niceville (J. As. B. 1901) places them all under frauenfeldii. An exactly similar case in every respect is presented by scherzeri, camorta and simulatrix and I have here united them all under scherzeri.
		climena ..	scherzeri, Fd.	Ni.	=camorta, M; simulatrix, W.M. & De N.	
		core, Cr. ..	....	I. B. An.		
			vermiculata, But.	Him. foothills.	niceviller, M. a cas ab.	
			asela, M. ..	C.		
		godarti, luc.	....	As.—B.	defigurata, Fruh. an ab.	
			(d. layardi, Druce).	....	=subdita, M.	
		andamanensis, Atk..	....	An.		
	(Penoa) ..	alcathoe. ..	double day i, Fd.	Sik-Up. B.	alcathoe God. Amboina.	
			esatia, Fruh.	S. B.		
		deione, Wd.	....	Sik.-B.	arida Fruh, Ruby Mines, a d. sf.	
			limborgii, M.	Up. Ten.		
			menetriesi, Fd.	S. Ten.		
	(Stictoplœa)	coreta, God.	....	S.	=coreoides, M.	
			montana, Fd.	C.		
		harrisi, Fd.	....	As.—B.	.....	harrisi is a very variable form and hopei is not a very satisfactory race; however Sikkim specimens always have the forewing discal spots well developed, while in the Eastern form these spots are often absent.
			hopei, Fd. ..	Sik.—As.		
	(Trepsichrois).	mulciber, Cr.	....	Simla-B.Ni.		
			kalinga, Doh.	Jaypur.		
	(Calliplœa).	mazares .	ledereri, Fd.	Ten.		
	(Euplœa) ..	corus, Fd..	....	C.		
			phœbus, But.	Ni.		
			vitrina, Fruh.	S.B.		
	(Isamia) ..	midamus ..	splendens, But.	E. Kum.-N. Ten.		
			margarita, But.	Ten.	=adamsoni Mav, brahma, M.	
		roepstorfii, M.	....	An.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.—*contd.*		DANAINÆ.—*contd.*				
Euploea—*contd.*	(Salpinx) ..	leucostictos.	novaræ. Fd.	B. Ni.	=leucogonys, But.	klugii is an extremely variable form and there are certainly many more unnamed than named varieties of this species. Leucostictos seems a distinct species, the hindwing is very pale presenting a great contrast to the forewing; also all the spots are conspicuously blue tinted.
		klugii, M...	....	Sik.-B.		
			crassa, But..	S.B.		
			kollari, Fd...	Sik.-S.		
			sinhala, M. ..	C.		
	(Danisepa).	diocletianus, Fab.	. ..	As.-B.		
			ramsayi, M..	Sik.		
NYMPHALIDÆ.		SATYRINÆ.				
Pararge ..	(Lasiommata).	maera	.. schakra, Koll.	Chit.-Sik.	.....	Fruhstorfer's arrangement of the Satyrinæ has been adopted; it has the advantage of bringing together the palæarctic genera and the sequence seems fairly natural. Seitz has been followed for the genus Satyrus.
		menava, M.	....	Bil.-Kash.	= mæroides, Fd. a cas var.	
		mœrula, Fd.	....	Chit.-Kum.		
	(Pararge).	eversmanni	cashmirensis, M.	Chit.-Kash.		
	(Chonala)..	masoni, El.	....	Sik.-Bhut.	usually in lethe, but better here.	
Rhaphicera	....	satricus, Db.	....	Sik.-As.		
		mooreí, But.	....	Simla-Sik.		
Melanargia	....	halimede, Mén.	....	E Up. B.		
Orinoma.	....	damaris, Gray.	...	Kangra.- B.		
Satyrus ..	(Paraeneis).	pumilus, Fd.	....	W.Him.		pumilus and bicolor are ochreous above, the latter with a very broad dark outer margin; palæarcticus is a dark brown insect with a prominent pale discal band as in Aulocera.
			bicolor, Seitz	Sik.(Chumbi).	.....	
		palæarcticus.	sikkimensis, Std.	Sik.		
	(Aulocera).	brahminus, Blanch.	....	Chit.-Sik.	= scylla. But., Werang, Lang.	True brahminus is in the B. M. from Sikkim; scylla from Kumaon is merely a small varietal form; brahminoides is a separate species and differs from brahminus in completely lacking the preapical ocellus on the underside of the forewing; it only differs from sibyllina, Leech, from Thibet in having the bands wider.
		sibyllina .	brahminoides, M.	Sik.(Chumbi.)		
		swaha, Koll.	....	Chit.-Sik.		
		padma, Koll.	....	Kash.-Sik.	.....	padma flies with loha in Sikkim and differs in the males constantly lacking the 2 white spots internal to the preapical ocellus on the forewing above.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
NYMPHALIDÆ —*contd.*		SATYRINÆ.—*contd.*				
Satyrus —*contd.*	(Aulocera) —*contd.*	loha, Doh.	....	Kum.-Ao.		Chumbica is a small race of loha, which does not have the band on the hindwing above continued to the dorsum, also this band on the underside in the females is narrow and sharply defined.
			chumbica, M.	Sik. (Chumbi).	....	
		saraswati, Koll.	....	Chit.-Sik.		
	(Karanasa).	hübneri, Fd.	....	Kash.-Lad.	= cadesia, modesta, M.	hübneri is a very variable form; Chitral specimens, called leechi by Moore, are larger with deeper bands and the ocelli on the forewing above have prominent white centres. Leechi. Groum from Samarkand was described first: it is a much smaller and paler insect. I propose to call the Chitral race *moorei* as leechi must be abandoned. I have omitted semele diffusa, But., of which the only known specimen, now in the B. M., is marked "locality doubtful."
			moorei, Ev...	Chit.	= leechi, M. (nec. Groum).	
		digna, Mar.	....	Chit.-Kash.		
		actæa	.. pimpla, Fd...	Bal-Lad.		
	Nytha)	.. parisatis, Koll.	....	Bal.-Chit-Kum.	= macropthalma, Evers.	
	(Philareta).	heydenreichi.	sha ndura, Mar.	Chit.		
		persephone, Hüb.	....	Bal.-Chit.	hanifa, Hard, spring form? = enervata, Std.	
	(Eumenis).	mniszechii.	baldiva, M. ..	Spiti, Kunawur.		
			lehana, M. ..	Chit-Lad.		
		theleph a ssa, Hüb.	....	Bal.		
Epinephele.	(Maniola)..	davendra, M.	....	Chit-Samarkand.	.....	E. davendra and latistigma have two lower discal ocelli on the hindwing below, while brevistigma has only one; latistigma has the male brand much stouter than in davendra, while the discal line below is inconspicuous, tenuistigma, Kojak, male, is an ab. of latistigma resembling davendra.
			brevistigma, M.	Balt-Lad.		
			latistigma. M.	Bal.	= tenuistigma, M.	
		narica, Hüb.	....	Bal.		
		cheena, M.	....	Chit-Nep.		
		lycaon	.. interposita Ersch.	Bal.	.....	pulchella and pulchra are separate species flying together; pulchella is ochreous, female as male, and often bearing a lower ocellus on the forewing above; pulchra male is dark brown, female ochreous with base much darker, the dark area being defined by a dark angled discal line.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ—*contd.*		SATYRINÆ—*contd.*				
Epinephele —*contd.*	(Chortobius).	pulchella, Fd.	....	Chit-Lad.		
		pulchra, Fd.	....	Chit-kum.	= neoza, Lang.	
		cœnonympha, Fd.	....	Kash.	= maiza, goolmurga, Lang.	
Cœnonympha.	(Lycla)	... myops	.. macmahoni, Sw.	Bal.	.....	C. macmahoni resembles a small Erebia and is unmarked except for a single blind ochreous, ringed ocellus on the forewing : myops, Std. from Alai, has some spots on the hindwing below.
Erebia	.. (Paralasa).	mani, DeN.	....	Chit-Lad.		
		kalinda, M,	....	Kash-Kum.		
		shalada, Lang.	....	Chit-Muss.		
	(Callerebia)	daksha, M.	....	Kash.		
		nirmala, M.	....	Kash-Kum.	= intermedia, cashapa, M.	Seitz gives "Erebia saxicola, Ober, N. Kashmir 6,000" while nirmala is placed in callerabia : his brief description and figures of saxicola agree exactly with a common Chitral insect found at 6000′ and it is undoubtedly a race of nirmala, differing from it in being more uniform below and only bearing on the hindwing a single very small ocellus, rarely surmounted by minute white spots. An aberration of this insect was described and figured by De Niceville under nirmala in J.B.N.H.S. XIV, 236.
			saxicola, Ober.	Chit.		
		annada, M.	....	Kash-Bhut.	W. S. f. = hybrida, But.	
			orixa, M. ..	As-up B.		
		scanda, Koll.	....	Kash-Kum.		
	(Dallacha).	hyagriva, M.	....	Kash-Kum.		
	(Hemadara)	narasingha, M.	....	B		
Ypthima ..	(Shania) ..	megalia, DeN.	....	N. Shan St.	.....	A new sub-genus for megalia, DeN, seems necessary and I propose the name *Shania*, iarba is doubtfully placed in the sub-genus Ypthima.
	(Nadira) ..	bolanica, Mar.	....	Bal.		
	(Kolasa) ..	chenui, Guér.	....	S.		
		ypthimoides, M.	....	Palni, Trav-hills.		
	(Ypthima)	iarba, DeN.	....	Manipur.	.....	
		hübneri, Kir.	....	I. B.		As ceylonica and hübneri fly together they are best regarded as separate species.
			kashmira, M.	Kash-Kulu		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
NYMPHALIDÆ. —*contd.*		SATYRINÆ.—*contd.*				
Ypthima (Ypthima) —*contd.*	—*contd.*	ceylonica, Hew.	....	Beng-S.C.	.....	I believe that the species affectata, etc., placed near baldus and methora will eventually be found to be races of one or the other of these two forms in spite of the differences in the male organs, especially in view of the fact that Elves found the male organs of hübneri, ceylonica, kashmira, jocularia and a hubneri from Sik all different. Undue importance is often given to minor differences in these organs.
	(Pandima)..	asterope ..	mahratta, M.	N. & Centr. I. B.	Asterepe. Klug. Africa.	
		inica, Hew.	....	N.&Centr.I.		
		lycus, DeN.	....	Khasi.		
			lycoides, Wat.	Up B.	.....	overlooked by Moore and Bingham.
		watsoni. M.	....	B.		
		nareda. Koll.	....	Kash-Kum.		
		newara. M.	....	Sik-As.		
			sarcoposa, Fruh.	B.		
	(Thymipa)..	philomela, Johan.	....	S.	=tabella. Mar.	
			indecora. M.	Kash-Kum.		
		baldus, Fab.	....	I. B.		
		affectata, El Ed.	....	As.		
		similis, El Ed.	....	S. B.		
		sobrina, El. Ed.	....	S. B.		
		methora, Hew.	....	Sik-B.		
			persimilis. El Ed.	Manipur.		
		dohertyi, M.	....	S. B.		
		savara, Gr S.	....	B. hills.		
		sakra, M. ..	....	Sik.		
			nikaea, M. ..	Kulu-Kum.	.....	Fruh gives matinia as a pale race from N.W. India.
			austeni, M. ..	As-B.		
		avanta, M..	....	Kash-B.		
			cerealis, Wat.	B (Myingyan).		
			striata, Hamp.	Nilgiris.		
			singala, Fd...	Centr. I-C.		
Zipœtis ..	....	scylax, Hew.	....	Sik-up B.		
		saitis, Hew.	....	S.		
Erites ..	....	medura ..	falcipennis, W.M.&DeN.	Kash-up B.		
		rotundata, DeN.	....	S. B.		
		angularis, M.	....	B.		
		argentina..	ines, Fruh. ..	Ten.	argentina, But Borneo.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.—contd.		SATYRINÆ.—contd.				
Ragadia	....	crisilda, Hew.	....	Cach-Ten.	.....	Fruh places critolaus and crito as races of crisilda.
		critolaus, DeN.	....	Ten.		
		crito, DeN.	....	Bhut-As.		
Lethe	.. (Lethe)	europa, Fab.	....	I. B.	= niladana and ragalva, Fruh.	Fruh. confines europa to the Philippine ,etc., giving niladana as the North Indian and ragalva as the South Indian race.
			nudgara, Fruh.	An.		
		dry petis, Hew.	tamuna, Doh.	Ni.		
			....	S. Oriss.		
			todara, M. ..	C.		
		dyrta, Fd..	....	Kash-B.	= rohria, Fab.	Aurivillius in 1897 stated that what had usually been called dyrta, Fd., should be rohria, Fab., and the insect known as rohria he renamed confusa: Bingham followed him but Seitz and Fruhstorfer have not and have put confusa as a synonym of rohria. As Bingham only appears to have followed Aurivillius. I have used dyrta but I think confusa ought to be used for what most authors call rohria
			nilgiriensis, Guer.	Centr. I-C.	Fruh. separates the Ceylon form as yoga.	
		daretis, Hew.	.. .	C.		
		insana, Koll	....	Chumba-Kum.		
			dinarbas, Hew.	Kum-As.		
		brisanda, DeN.	.. .	Bhut-As.	This seems a good species.	
		confusa, Aurivill.	....	Simla-Sik.	= rohria, Auct, nec. Fab.	
			gambhara, Fruh.	As-Up B.		
	(Dionana)..	margaritae, El.	....	Bhut.		
	(Neme)	naga, Doh..	....	Up As.		
	(Nemetis)..	minerva, Fab.	.....	B.		
			tritogenia, Fruh.	Ten.	I have not seen this.	
	(Debis) ..	sinorix, Hew.	. ..	Sik-B.		
		mekara, M.	....	Sik-B.	Fruh. separates the As-B. race as zuchara.	
		chandica, M.	.. .	Sik-B.	Fruh. separates the As-B. race as flanone.	
		distans, But.	....	Sik-B.		
		kansa, M ..	....	Kum-Sik.		
			zeugitana, Fruh.	As.B.	Fruh. separates the Ten. race as vaga, Fruh.	
		serbonis, Hew.	....	Sik-As.		
		satyavati, DeN.	....	Sibsagar.		
		vindhya, Fd.	....	Sik-B.	Fruh. separates the Ten. race as ladesta.	
		dynsate, Hew.	....	C.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, etc.*	*Notes.*
NYMPHALIDÆ —*contd.*		SATYRINÆ.—*contd.*				
Lethe —*contd.*	(Tansima)..	verma, Koll.	....	Kash-Kum.		
			sintica, Fruh.	Sik.-B.	.. Fruh. separates the Ten. race as stenopa.	
	(Rangbia)..	gulnihal, DeN.	....	Bhut.-As.		
			peguana, M...	B.		
		scanda, M..	....	Sik.-As.		
		bhairava, M	....	Sik.-As.		
		latiaris, Hew.	....	Sik.-B.		
			perimele, Fruh.	Ten.	.. Specimens from the Naga hills resemble his race somewhat.	
	(Sinchula)..	vaivarta, Doh.	....	Kulu-Kum.		
		sidonis, Hew.	....	Kum.-As.		
		nicetella, DeN.	....	Sik.		
		sidera, Mar.	....	Sik.-B.		
		nicetas, Hew.	....	Kulu-Sik.		
		maitrya, DeN.	....	Simla-Sik.		
		visrava, M.	....	Sik.-Bhut.		
	(Korrata)..	tristigmata, El.	....	Sik.	.. ..	Seitz records a specimen of L. calipteris from Kashmir but there seems a good deal of doubt about the locality.
		lyncus, DeN.	....	Sik.		
	(Zophoessa)	atkinsonia, Hew.	....	Sik.-Bhut.		
		jaunrida, DeN.	....	Kulu-Kum.		
			elwesi, M. ..	Sik.		
		moelleri, El.	....	Sik.		
		kabrui, Tytler.	....	Naga H.	.. This new species is shortly to be described by Maj. Tytler.	
		baladeva, M.	....	Sik.		
			asia, Fruh ..	Garhwal-Kum.		
		ramadeva, DeN.	....	Sik.		
		andersoni, Atk.	....	Bhamo.		
		goapara, M.	....	Kum.-As.		
			narkunda, Fruh.	Simla.		
		sura, Db. ..	....	Sik.-B.		
		dura, Mar.	....	S.-B.		
			gammiei, M..	Bhut.		Seitz gives L. bhadra and separately L. armandii khasiana from India; bhadra was described from the dark wet season form and armandii from the pale dry season form in China; khasiana is undoubtedly a seasona form of bhadra and armandii is the local race from China.
	(Blanaida).	bhadra, M	....	Sik.-B.	=khasiana, M.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ —contd.	SATYRINÆ—contd.					
Lethe —contd.	(Blanaida) contd.	pulaha. M.	....	Chumba-Kum.		Seitz uses Neope for a genus: DeN. stated that this name was preoccupied by birds and proposed Blanaida instead.
			pulahoides, M	Sik.-B.		
		muirheadi.	bhima, Mar..	B.	muirheadi, Fd., China.	
		yama, M...	....	Kulu-Kum.		
			yamoides, M.	Sik.-B.		
Neorina ..	(Neorina) ..	hilda, Wd.	....	Sik.-As.		
	(Hormianax).	chrishna ..	archaica, Fruh.	Ten.	chrishna, Wd., Java.	
		patria	.. westwoodi, M.	As.-Ten.	patria. Leech, China	
Coelites ..	....	nothis	.. adamsoni, M.	Bhamo.	nothis, Bdv., Siam	
		epiminthia.	binghami, M.	Ten.		
Mycalesis..	(Virapa) .	anaxias. Hew.	....	Sik.-B.-S.	Fruh. separates the Burma form as semate.	
			radza, M. ..	Au.		
			manii, Doh..	Ni.		
		adamsoni. Wat.	....	Up.B.		
		anaxoides, Mar.	....	S. B.		
	(Gareris) ..	francisca..	sanatana. M..	Kulu-B.	Fruh. separates the Burmese form as gomia.	
	(Sadarga) ..	gotama	.. charaka, M..	As.-B.		
	Suralaya) .	orseis, Hew.	....	Naga H.-Ten.	Fruh. separates the Indian form as nautilus, But.	
	(Calysisme)	perseus, Fab.	....	I. B. C.	.....	
		minous. L.	....	NI.-B.Ni.	=nicobarica, M.	
			polydecta. Cr.	Centr I-S. C.		
		perseoides. M.	....	B.	=intermedia, M.	I have placed subdita, M. as a race of perseoides; they both have a very similar male brand on the forewing below. Bingham described a similar form from Mysore which Fruhstorfer has named igilia: I have the same insect exactly from Pachmarhi. I also have several specimens from the Khasi Hills (w. & d. s. f.) which belong to this species: they are larger and brighter than the other forms of perseoides and are very close to visala but the male brand is short and pale brown as in perseoides, not long and silvery as in visala: I propose to call this form *khasia*.
			khasia, Ev...	khasi Hills.		
			igilia. Fruh.	Pachmarhi-Mysore.		
			subdita. M...	S. C.		
		visala, M....	....	Kum-B. Centre I. & Madras.	Fruh. separates the Ten. form as neovisala.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
NYMPHALIDÆ —*contd.*		SATYRINÆ.—*contd.*				
Mycalesis —*contd.*	(Calysisme) —*contd.*	visala, M. —*contd.*	orcha. Ev. ..	Palni, Animalais Hills.		In the B. M. are several specimens of visala from the Animalais and I have others from the Palnis which differ constantly from the Northern visala these specimens belong to an intermediate form, some were caught in September and others in February. The male brand is as in visala, the wings are not so pointed, under the ocelli are smaller and never quite obsolete; in the drier forms the lower ocellus on the forewing below shows up as a very prominent white spot: the white discal line is much diffused outwards. I propose to call this form *orcha*.
			andamana. M.	An.		
		evansii. Tyt.	....	Manipur.	This new species will shortly be described by Maj. Tytler.	
		rama. M. ..	....	C.		
	(Telinga) ..	oculus. Mar.	....	Palni, Trav. Hills.		
		adolphei. Guér.	....	Nilgiri, Mangalore.		
	(Pachama)..	mestra. Hew.	....	Bhut-As.	Fruh. separates the Bhutan form as vetus.	
		suavolens. WM and DeN.	....	Sik.-Up B.		
	(Samanta)..	nicotia. Hew.	....	Muss. B.		
			nudgara. Fruh.	Ten.		
		misenus. DeN.	....	Sik-As.		
		heri. M ..	....	Kum-Bhut.		
		malsara. M.	....	Sik..B.	placed as a race of mamerta, Cr. (=mineus) by Fruh.	Malsara and lepcha are usually considered as races of one species, they, however, occur together in the Naga Hills, Manipur and Upper Burma. Watson (in J.B.N.H.S.X.) said "malsara and lepcha seem to meet and mix in Chindwin." Major Tytler has sent me a good series of both forms from Manipur and I am convinced that they are separate species. The Eastern form I propose to call *watsoni*, it differs from the Western form in always having 1 upper and 2 (not 1) lower ocelli on the forewing above.
		lepcha. M..	....	Kulu-Kum.		
			bethami, M...	Pachmarhi		
			davisonii, M.	Palni H.		
			watsoni, Ev..	As.-Up. B.		
	(Kabanda)..	malsarida, But.	....	Cash-As.		
	(Nissanga)..	patnia. M.	....	C.		
			junonia, But.	S.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.—*contd.*		SATYRINÆ—*contd.*				
Mycalesis.—*contd.*	(Culapa) ..	mnasicles..	perna, Fruh.	S.B.		
	(Myrtilus).	mystes, DeN.	....	Up. B.		
	(Loesa) ..	oroatis ..	surkha. Mar.	Ten.		
	(Orsotricona)	meda, Fab.	....	NI. B.	.....	Orsotricona is usually put as a separate genus, but it would seem more convenient to put it as a sub-genus of Mycalesis as DeNiceville did.
			mandata. M.	S. C.		
Melanitis..	....	leda ..	ismene. Cr...	I. B. C.		
		phedima ..	bela. M. ..	Kash.-B.	Fruh. separates the West Himalayan form as gakissa and the Tenasserim form as ganapati.	
			bothami. DeN.	Pachmarhi.		
			varaha. M. ..	S.		
			tambra. M...	C.		
		zitenius. Herbst.	....	E. Kum.-B.	.....	Gokala is undoubtedly a race of zitenius; of kalinga there is only one specimen in the B. M., which is intermediate between gokala and zitenius.
			auletes. Fruh.	Ten.		
			gokala. M. ..	S.		
			kalinga M. ..	Godaveri.		
Cyllogenes.	....	suradeva. M.	....	Sik.		
		janotæ, DeN.	....	Bhut. As.		
Parantirrhœa.	....	marshallii, W. M.	....	Trav.		
Anadebis ..	(Anadebis).	himachala, M.	....	Sik.-Up. B.	...	
	(Zethera) ..	diadernoides M.	....	Ten.		
Elymnias..	(Elymnias).	hypermnestra.	undularis, Drury.	Muss-Up. B.		
			tinctoria, M..	B.		
			caudata, But.	S.	.....	caudata is usually placed as a separate species, but it seems to have no more right to be considered so than has fraterna.
			fraterna M..	C.		
		cottonis, Hew.	....	An.		
			obnubila, Mar.	S. B.		
		panthera ..	mimus, W.M. & DeN.	Ni		
		dara ..	dædalion, DeN.	B.	dara, Dist. N. Borneo.	
	(Melynias).	singhala, M.	....	C.		
		pealii, WM.	....	As.		
		nesaea ..	timandra, Wall.	Sik.-As.		
			cortona, Fruh.	B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ. —*contd.*		SATYRINÆ—*contd.*				
Elymnias. —*contd.*	(Melynias) —*contd.*	malelas, Hew.	....	Sik.-B.		
			nilamba, Fruh.	Kum.		
			saueri, Dist.	Ten.		
		patna, Wd..	....	Kum.-As.		
			patnoides, M.	B.		
	(Mimadelias).	vasudeva, M.	....	Sik.-As.	=thycana & deva, M.	
			burmensis, M.	B.		
	(Bruasa) ..	penanga ..	che'ensis, DeN.	As.-B.	penanga, Wd., Malay Penin.	
	(Agrusia) ..	esaca, Wd..	....	Mergui.	= andersonii, M.	
		MORPHINÆ.				
Clerome ..	....	arcesilaus, Fab.	....	Sik.-B.		
		eumeus ..	incerta, Stdg.	S. Shan St.		
			assama, Wd..	As.		
Melanocyma.	....	faunula ..	faunuloides, DeN.	Up. B.		
Xanthotænia.	....	busiris, Wd.	....	Ten.		
Thaumantis.	....	lucipor, Wd.	....	Ten.		
		diores, Wd.	....	Sik.-B.		
Thauria ..	....	aliris ..	intermedia, Croweay.	B.	pseudaliris, But Malay Penin.	
Stictopthalma.	....	camadeva, Wd.	....	Sik.		
			nicevillei, R b.	As.		
			camadevoides, DeN.	Up. B.		
		nourmahal, Wd.	....	Sik. Naga Hills.		
		nurinissa, DeN.	....	Bhut.		
		howqua ..	sparta, DeN.	Manipur.		
		louisa, WM.	....	S. B.		
Zeuxidia ..	....	amethystus	masoni, M.	S. B.	.....	Zeuxidia doubledayi has not been included by Moore and Bingham, but DeN. recorded it in J.B.N.H.S. XII, 829, from Tenasserim.
		doubledayi, Wd.	....	Ten.		
Amathusia.	(Amathusia.)	phidippus, Joh.	....	B. Travancore.		
			andamanensis, Fruh.	An.		
	(Amathuxidia.)	amythaon, Db.	....	Sik.-B.		
Æmona ..	....	lena, Atk.	....	B.		
		amathusia, Hew.	....	Sik.-As.		
Discophora	....	celinde ..	continentalis, Std.	Sik.-B.		
			andamanensis, Std.	An.		
		deo, DeN..	....	Up. B.		
		lepida, M..	....	S. C.		
		tullia ..	indica, Std.	Sik.-B. Kan.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.,	Notes.
NYMPHALIDÆ.—*contd.*		MORPHINÆ.—*contd.*				
Enispe ..	....	euthymius, Db.	....	Sik.-B.	tessellata, M., a seasonal form.	
		cycnus, Wd.	....	Sik.-B.		
		NYMPHALINÆ.				
Charaxes ..	(Haridra) ..	psaphon, Wd.	....	C.	.....	Rothschild and Jordan's "Revision" of this group in Novitates Zoologiæ has been followed.
			imna, But.	Beng.-S.		
		polyxena ..	hierax, Fd.	Sik.-B.	.....	The numerous varieties of hierax do not seem to be worth retaining; hierax can be used for the bandless forms and hipponax for the bandedforms. The form naganum described by Maj. Tytler seems constant and confined to these hills only; as no other form occurs with it, I think it is best treated as a separate race.
			(v. hipponax, Fd).			
			naganum, Tytler.	Naga H.		
			hemana, But.	Muss-Kum.		
		aristogiton, Fd.	....	Sik.-B.	= desa and adamsoni, M.	
		marmax, Wd	....	E. Kum.-B.		
		kahruba, M.	....	Kum.-B.		
		durnfordi.	nicholi, Gr.S.	S. B.		
		distanti, Hon.	....	Ten.		
		fabius, Fab.	....	I. S. C.	raidhaka, Rhé Philippe, is a cas ab.	
			sulphureus, Roth.	Naga H.,-B.		
Eulepis ..	(Eulepis) ..	athamas, Drury.	....	N.I.-B.	Röber rejects Eulepis for Eribœa.	
			agrarius, Sw.	S. C.		
		arja, Fd. ..	....	Sik.-B.		
		schreiberi..	assamensis, Roth.	As.-B.	.....	Bingham unites these races of schreiberi since one specimen from Assam agrees with Kanara specimens, ignoring he differences pointed out by Rothschild and Jordan based on long series.
			wardi ..	S.		
		jalysus, Fd.	....	S.-B.		
		moori ..	sandakanus, Fruh.	As.-B.	= marginalis, Roth. s. f. or var.	
	(Murwareda).	dolphis, Db.	....	As.-Up. B.		
			concha, Wd...	S.-B.		
		dolon, Wd.	....	W.-Him.		
			centralis, Roth.	Sik.-As.	Fruh separates the Assam form as magniplaga.	
			grandis, Roth.	Shan St.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.,	Note.
NYMPHALIDÆ.—*contd.*		NYMPHALINÆ.—*contd.*				
Eulepis.—*contd.*	(Murwareda).—*contd.*	nepenthes, G.S.	....	Shan St.		
		eudamippus, Db.	....	Kum.-B.		
			nigrobasalis, Lathy.	Shan St.		
Heloyra ..	....	hemina, Hew.	....	Sik.-B.		
Dilipa ..	....	morgiana, Wd.	....	Kulu-Up.B.	.....	
Apatura ..	(Apatura)..	ambica, Koll.	....	Kash.-Ten.	bhavana M., may be a variety or a seasonal form.	The Chitral form of ambica deserves a name, *chitralensis*; it is much larger, on the forewing below the round spot in 2 is absent; the male has a white spot on the costa of the forewing above; the female has the white submarginal spots very large and diffused. The differences in markings may be inconstant but the difference in size is very striking.
			chitralensis, Ev.	Chit.		
		ilia ..	here, Fd. ..	N. Shan St.		
	(Mimathyma).	chevana, M.	....	Sik.-Up. B.		
	(Chitoria)..	sordida, M.	....	Sik. B.		
	(Dravira)..	nupi, Doh.	....	Up As.	fulva, Leech, is a race of this.	
		pallas ..	florenciæ, Tytler.	Naga H.		
	(Eulacoura)	osteria, Wd.	....	Ten.		
	(Narsenga).	parvata, M.	....	Sik.-As.		
	(Rohana) ..	parisatis, God.	....	Kum.-Ten.		
			camiba, M...	S. C.		
Herona ..	....	marathus, Db.	....	Sik.-Up. B.		
			angustata, M.	S. B.		
			andamana, M.	An.		
Hestina ..	....	nama, Db.	....	Muss-B.	melanina, Fruh., a melanitic ab.	
Parhestina.	....	persimilis, Wd.	....	Sik.-As.	I have an ab. of this all black.	
			zella, But. ..	Simla-Kum.		
		mena ..	nicevillei, M.	Chumba.		
			jermyni, Druce.	Muss.	? a separate species.	
Euripus ..	....	halitherses, Db.	....	Sik.-M.	female = isa, M. haliastus, But.	Euripus halitherses has two dimorphic females; the first may be called halitherses (= isa M., haliartus, But.) and has a white band on the forewing with more or less white on the hindwing; the second (= alcathœoides, DeN.) has no white on the forewing, the hindwing is more or less white and often bear submarginal spots. The form cinnamoneus, M., is merely a variety of alcathœoides and differs in having some white on the dorsal margin of the forewing, while the whole of the outer half of the hindwing is white.
				(female d. alcathœoides, DeN.)		
				(female v. cinnamoneus, M.)	= nyctelius, Db.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.,	Notes.
NYMPHALIDÆ. —*contd.*		NYMPHALINÆ.—*contd.*				
Euripus —*contd.*	(Rohana) —*contd.*	consimilis, Wd.	....	Dun-B.		
			meridionalis, WM.	S.		
		funebris, Leech.	....	Naga Hills, China.	obtained by Maj. Tytler.	
Sephisa ..	....	dichroa, Koll.	....	Chit-Kum.		
		chandra, M.	....	Kum.-B.	.....	Sephisa chandra has 3 forms of female, *viz.*, I. uniformly dark = *chandra*; II with the hindwing white = *albina*, nov.; and III with a white preapical band on the forewing, the hindwing being dark = *chandrana*, nov. Whether these forms should be looked upon as varieties or dimorphs seems doubtful.
				(female chandrana, Ev.) (female v. albina, Ev.)		
Stibochiona.	....	nicea, Gray.	....	Kulu-B.		
			subucula, Fruh.	Karen H.		
Dichorragia.	....	nesimachus, Bdl.	....	Kulu-B.		
Neuronigma.	....	doubledayi, Wd.	....	Sik.-Up. B.	= Siva, Wd: female = fraterna, M.	N. nonius was described by DeN. in Ann. N. H. XVII. 396 (1896) and De N. pointed out in J. B. N. H. S. XII. 329, that Moore had overlooked it: Bingham also omitted nonius.
			nonius, DeN.	S. B.		
Abrota ..	....	ganga, M...	....	Sik.		Stichel unites ganga and confinis but Fruhstorfer again separates them.
		confinis, Fd.	....	Sik.-Bhut.	= jumna, M. and ? mirus, Fab.	
Adolias ..	....	dirtea, Fab.	....	B.	Fruh. separates eleanor, S. Burma and pardalis, M. Mergui.	
			khasiana, Sw.	As.		
			eleanor, Fruh.	S. B.	.....	Moore is followed as regards the name Adolias for dirtea, etc.: Bing. uses Symphaedra, here used for nais as done by Moore.
			pardalis, M.	Mergui.		
		cyanipardus, But.	....	Sik.-As.	Bing. as race of dirtea.	
Euthalia ..	(Bassarona)	teuta, Db.	....	Sik.-B.	= ira, M. ? the race from S.B.	Bing. separates Dophla for what DeNiceville called the first section of Euthalia.
			teutoides, M.	An.		
		reota, DeN.	....	As.-B.		
		goodrichi, Dist.	....	S. Ten.	Bing. as race of teuta.	
			gupta, DeN.	B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ. —*contd.*	NYMPHALINÆ.—*contd.*					
Euthalia. —*contd.*	(Labranga).	durga, M.	....	Sik.-Bhut.		
		duda, Std.	....	Sik.-As.	Seitz = 'durga.	
	(Limbura)..	nara, M. ..	....	Sik.-As.		
	(Mahalda)..	sahadeva, M.	....	Nep.-As.		
			narayana, Gr. S. & Kir.	B. (Ruby Mines.)		
		iva, M. ..	....	Sik.-As.		
	(Zalapia) ..	patala, Koll.	....	Chamba-Nep.		
			taooana, M...	S. B.		
	(Dophla) ..	evelina, Stall.	....	C.		
			laudabilis, Sw.	S.		
		derma, Koll.	....	Syl.-B.		
	(Rangara)..	dunya, Db.	....	S. Ten.		
	(Cynitia) ..	cocytus, Fab.	....	B.		
		lepidea, But.	....	Kum-B.S.		
			andersoni, M.	Ten.		
	(Saparona).	cibaritis, How.	....	An. Ni.		
	(Haramba).	appiades, Mén.	....	Sik.-Up. B.	.....	In spite of all that has been written, I believe that sedeva and adima are well defined local races of appiades: adima only occurs at high elevations while sedeva is only found at low elevations.
			sedeva, M. ..	As.-Up. B.		
			adima, M. ..	Khasi-Up. B. (hills).	=khasiana, Sw.	
			julii, Bougain.	S. B.		
		jahnu, M..	....	Sik.-B.		
	(Chucapa)..	franciæ, Gray.	....	Nep.-B.	.....	
	(Tasinga) ..	anosia, M..	....	Sik.-B.		
	(Nora) ..	kesava, M..	....	Sik.-Up. B.		
			rangoonensis, Sw.	S. B.		
	(Kirontisa).	telchinia, Mén.	....	Sik.-As.		
	(Euthalia)..	phemius, Db.	....	Sik.-B.		
		zichri, But.	....	S. B.		
		binghami, DeN.	....	Ten.		
		lubentina, Cr.	....	Dun. B. Central, I.S.C.		
		garuda, M..	....	N. I. B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri.

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.—*contd.*		NYMPALINÆ.—*contd.*				
Euthalia—*contd.*	(Euthalia)—*contd.*	....	diversa, Ev.	S. C.	.....	I propose to call the Southern form of garuda, *diversa*: though the male is very much the same, the female differs in the following respects: there are always 5 white spots on the forewing and the apical spots always seem to have an outward tendency whereas in the N. form these apical spots have an inward tendency being often joined to the inner discal spots. On both wings the outer area is prominently paler.
			acontius, Hew.	An.		
		vasanta, M.	....	C.	.....	Bingham places vasanta as a race of garuda but they fly together in Ceylon and do not intergrade.
		jama, Fd. ..	....	Sik.-B.		
		apicalis, Voll.	....	As.-B.		
		eriphyla e, DeN.	....	As.-Ten.	This is a distinct species.	
		kanda, M. .	....	Ten.		
		nais, Forster.	....	Him.-S.C.		
Parthenos.	....	gambrisius, Fab.	....	E. Beng.-B. An. Ni.		
			(V. apicalis, M.)			
			virens, M. ..	S.		
			cyaneus, M. .	C.		
Liminitis ..	(Moduza) ..	procris, Cr.	....	I. B.	.....	Liminitis is here extended to include the closely allied genera Moduza and Auzakia.
			anarta, M. ..	An. S. B.		
			calidasa, M.	C.		
	(Parasarpa)	zayla, Db. .	....	Sik.-As.		
	(Sumalia)..	dudu, Wd. .	....	Sik.-B.		
		zuleoma Db.	....	Sik.-B.		
		daraxa, Db.	....	Kum.-B.		
	Najas) ..	trivena, M.	....	Kash-Muss.	The two forms intergrade in Kashmir.	
			ligyes Hew. .	Chit.-Kash.		
	(Auzakia)..	danava, M.	....	Muss.-Up. B.		
	(Bhagadatta.)	austenia, M.	....	Cach.-As.		
Lebadea ..	....	martha. Fao.	....	As.-B.		
			ismene, Db. .	Sik.-Bhut.		
			attenuata, M.	Ten.		
Pantoporia.	(Pantoporia.)	nefte ..	inara, Db. ..	Sik.-Up B. Orissa. S.	.....	Pantoporia is here extended to include the genus separated by Bingham as Athyma.
			asita, M. ..	S. B.		
			nivifera, But.	Mergui.		
			rufula, DeN.	An.		
		selenophora, Koll.	....	Muss.-B. S.		
		zeroca, M..	....	Kum.-B.		
		cama, M. ..	....	Muss.-B.		
		kresna, M..	....	As. B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms. &c.*	*Notes.*
NYMPHALIDÆ. —*contd.*		NYMPHALINÆ.—*contd.*				
Pantoporia. —*contd.*	(Tatisia). ..	kanwa., M.	....	As.-B.		
	(Parathyma.)	sulpitia, Cr.	....	B.		
	(Kironga) ..	ranga, M...	....	Sik-B. S.		
		abiana, M...	....	Morgui.		
	Condochates.	opalina, Koll.	....	Kash.-Kum.		
			orientalis, El.	Sik.-B.		
	(Athyma) ..	perius, L...	....	I. B.		
	(Tacola) ..	larymna, Db.	....	Ten.		
	(Tacoraæ).	asura, M...	....	Kulu.-B.		
			idita, M. ..	Mergui.		
	(Chendrana.)	pravara, M.	....	Cach.-B.		
	(Tharusia).	jina, M. ..	....	Nep.-Sik.		
Neptis ..	(Neptis) ..	hylas ..	varmona, M..	I.C.(plains).	ourynome, L. China.	Rahinda is here placed as a subgenus of Neptis; heliodora forms a connecting link.
			astola, M. ..	Him.-Up.B. (hills).		
			adara, M. ..	S. B. Ten.		
			andamana, M.	An.		
			nicobarica, M.	Ni.		
		soma, M. ..	....	Muss. B.	Stichel & DeN. as nandina, M.	
			clinia, M. ..	An.	=mananda, M.	
			hampsoni, M.	Nii.		
			kallaura, M..	N. Kan.-Trav.		
		yerburii, But.	....	Kash.-Up. B.		
		mahendra, M.	....	Chit.-Kum.		
		nata, M. ..	....	B.		
	(Andrapana).	magadha, Fd.	....	B.	.....	The races of columella given here seem well founded; from the Nicobars there is 1 female in the B. M. for which I propose the name *kankena*; it is considerably larger than the continental forms and below differs considerably, all the white markings especially the marginal ones being more developed; the lunular band beyond the submarginal band on the hindwing forms a series of deep crescents.
		columella, Cr.	khasiana, M..	Bhut.-Up B.		
			....	Dun.-Up.B.		
			nilgirica, M..	Centr.-S.		
			martabana, M.	B.		
			kankena, Ev.	Ni.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ—*contd.*		NYMPHALINÆ.—*contd.*				
Neptis.—*contd.*	(Andrapana)—*contd.*	jumbah, M.	....	Beng.-S.C. S.B.-An.		
	(Bimbisara)	cartica, M..	....	Sik.-As.		
			nashona, Sw..	Khasi.		
			burmana, DeN.	B.		
		sankara, Koll.	....	Kash.-Kum.	.....	The form quilta is not a very satisfactory one; sankara gradually changes from the Western Himalayas to Burma and it is difficult to define the limits of any particular race; the Burmese form differs just as much from the Assam form, as the latter does from the W. Himalayan form; in Sikkim typical sankara and quilta occur.
			quilta, Sw. ..	Sik.-B.		
		harita, M..				
			nar, DeN. ..	An.		
			....	E.Beng.-B.		
		vikasi ..	pseudovikasi, M.	Kum.-As.		
			anjana, M. ...	S. B.		
		ebusa, Fd..	....	Ni.	.....	There are 3 specimens of ebusa, a Philippine insect, in the B. M. from the Nicobars.
			fuliginosa, M.	Ten.		
	(Stabrobates.)	manasa, M.	....	Sik.	= nyctea, DeN. ..	The type of manasa remains unique and I am convinced that nyctea is inseparable from it. There is a Neptis in the B. M from Sikkim and I have 2 others caught there with nyctea, which I propose to call *melba*; above it is similar to narayana but the spot at base of 3 is missing on the forewing: below it is pale ochreous marked as narayana but the marginal lines on the hindwing and the apical margins on the forewing are obsolete. The type of melba is in the B. M
		melba, Ev.	....	Sik.		
		narayana, M.	....	Kulu.-Kum.		
			nana, DeN ..	Sik.-Bhut.		
			asterastilis, Ober.	Up. B.		
		zaida, Db..	....	Murree-Sik.		
		ananta, M..	....	Chamba-B.		
		radha, M..	....	Kum.-Up B.		
		ananta M..	....	Chamba-B.		
		miah, M...	....	Sik.-As.		
			nolana, Druce	B.		
		viraja, M..	....	Kum.-B, Orissa. S.		
	(Lasippa) ..	heliodore, Fab.	.. .	Cach.-B.		
	(Rahinda)..	hordonia, Stoll.	....	I. B.	.....	Mr. Bell, in N. Kanara, has found that hordonia has 2 forms of larva possibly representing 2 separate species.
			sinuata, M ..	C.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
NYMPHALIDÆ. —*contd.*		NYMPHALINÆ —*contd.*				
Neptis. —*contd.*	(Rahinda). —*contd.*	onacalia, Hew.	....	An.-Ni.		
		peraka, But.	....	As.-B.		
		dindinga, But.	....	S. B.	seems to be a distinct species.	
		aurelia, Std.	....	As.-B.		
		assamica, M.	....	As.		
Cyrestis ..	(Cyrestis)..	thyodamas, Bdl.	....	I. B.		
			andamanica, WM & DeN.	An.		
		nivea ..	nivalis, Fd...	B.	nivea, Z.S., Malay Penin.	
		tabula, DeN.	....	Ni.		
	(Apsithra)..	periander, Fab.	....	Mergui.		
			binghami, Martin.	Ten.		
		cocles, Fab.	....	Sik.-B., Godaveri.	=natta, Sw.	.. The forms of cocles appear to be seasonal.
			andamanica, WM. & DeN.	An.		
	(Chersonesia).	peraka, Dist.	....	Ten.		
		risa, Db. ..	....	Kum.-B.	.....	Cyrestis is here extended to include the closely allied Chersonesia.
		rahria ..	rahrioides, M.	Ten.	quite separate from risa.	
Junonia ..	....	iphita, Cr..	....	I. B. C.		
		lemonias, L	....	I. B. C.		
		hierta, Fab.	....	I. B. C.		
		orithyia, L.	....	I. B. C.		
		atlites, Joh.	....	I. B. C.		
		almana, L.	....	I. B. C.		
Vanessa ..	(Vanessa)..	cardui, L..	....	I. B. C.		
		indica, Herbst.	....	N. I.-B.		
			nubicola, Fruh.	S. C.		
	(Kanîska)..	canace, Joh.		Chit.-B. S.		
			haronica, M	C.		
	(Eu vanossa.)	antiopa, L.	....	Sik.-Bhut.		
	(Aglais) ..	cashmirensis. Koll.	....	Chit.-Sik.	.....	Stichel puts rizana and ladakensis as races of urticæ, but they seem to fly together: he puts cashmirensis separate, stating that its larva is different.
		urticæ. ..	rizana. M. ..	Chit.-Sik.		
		ladakensis, M.	....	Kash.-Sik.		
	(Eugonia)...	xanthomelas.	....	Chit.-Kum.	=fervescens, Stich. and fervida, Stdfss.	Stichel gives xanthomelas fervescens, Stich. and polychloros fervida, Stdfss. as both from India: I do not think there is more than one form occurring in India, inseparable from xanthomelas.
	(Polygonia).	v. album., Fab.	....	Chit.-Kash.	=vau-album, Wv.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HYMPHALIDÆ —*contd.*		NYMPHALINÆ—*contd.*				
Vanessa —*contd.*	Polygonia —*contd.*	c. album...	interposita, Stoll.	Bil.-Chit.		
			cognata, M...	Kash.-Kum.	.....	interposita is usually regarded as a race of egea, Cr, but if the Chitral form is really egea, it runs into cognata. In the B. M. interposita is placed as a form of c. album.
			agnicula, M.	E. Kum.-Bhut.	=tibetana, El.	
Arasohnia.	....	prorsoides..	dohertyi, M	Manipur. Naga H.		
Symbrenthia.	....	hippoclus..	lucina, Cr. ..	Simla-B. E. ghats.	=khasiana, M.	.. Fruh. confines lucina to China and gives khasiana as the Indian form
		hypselis ..	cotanda, M...	Kum.-As.	hypselis, God., Jva.	Sinis, DeN., was originally described as the Indian race of hypselis; Fruh. separates the Assam form as assama, Fruh., and gives sinis from Ten.
			sinis, DeN...	Ten.		
		brabira, M.	....	Kash.-Sik.	Fruh. separates the Sikkim form as sivokana, M.	
		niphanda, M.	....	Sik.-B.		
			(v. silana, DeN.)		Bingham. as a race of niphanda	
Prothoe. ..	(Prothoe)..	francki ..	angelica, But.	S. B.		
			regalis, But,	Up As.		
	(Agatara) ..	calydonia..	belisama, Crow.	S. B.		
Rhinopalpa	....	polynice ..	birmana, Fruh	Cash.-B.		
Yoma ..	....	sabina ..	vasuki, Doh.	B.		
Hypolimnas.	....	bolina, L...	....	I. B. C.		
		misippus, L.	....	I. B. C.	female =diocippus, Cr.	
			(female d. inaria, Cr.) (female v. alcippoides, But).			
Penthema.	....	lisarda, Db.	....	Sik.-Up. B.		
		darlisa, M..	....	S. B.		
		binghami, WM.	....	Ten.		
Doleschallia.	....	bisaltide ..	continentalis, Fruh.	Sik.-B.	.....	There is not sufficient material in the B. M. to judge whether these races are worth retaining.
			malabarica, Fruh.	S.		
			ceylonica, Fruh.	C.		
			pratipa, M...	Ten.		
			andamanensis, Fruh.	An.		
Kallima.	....	inachus. Bdl.	....	Kum.-As. Contr. I		
			huegeli, Koll.	Kash.-Muss		
			limborgi, M..	B.		
		horsfieldii, Koll.	....	S.	= wardi, M.	
			philarchus, Wd.	C.		
			alompra. M.	B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
NYMPHALIDÆ —*contd.*		NYMPHALINÆ—*contd.*				
Kallima —*contd.*	....	knyvetti, DeN	....	Sik.-B.		
		albofasciata, M.	....	An.		
Terinos ..	....	clarissa, Bdl.	....	Ten.		
Cynthia ..	....	erota, Fab..	....	Sik.-B.	= pura, Sw.; circe, Faw.	
			saloma, Sw...	S.		
			asela, M. ..	C.		
			pallida, Std..	An.		
Issoria ..	....	sinha, Koll.	....	Muss.-B. Oriss.		
Atella ..	....	phalanta, Drury.	....	....		
		alcippe ..	alcippoides, M.	Sik.-B. S. An.		
			ceylonica, Manders.	C.		
			fraterna, M..	Ni.	hardly worth separating.	
Cupha ..	....	erymanthis.	lotis, Sulz. ..	Muss.-B. Ni.	erymanthis, Drury, Malay Peninsula; nicobarica, Fd., not separate.	
			andamanica, M.	An.		
			maja, Fruh..	S.		
			placida, M. ..	C.		
Cirrochroa.	(Ducapa) ..	fasciata, Fd.	....	Ten.	=flavobrunnea, Cr., S.	
	(Cirrochroa.)	bajadeta, M.	....	S. Ten.		
			nicobarica, WM. & DeN.	Ni.		
		thais, Fab..	....	S.		
			lanka, M. ..	C.		
		surya, M...	....	Ten.		
		mithila, M.	....	Sik.-B.		
			anjira, M. ..	An.		
		aoris, Db...	....	Sik.-Bhut.		
			jiraria, Sw...	As.		
			olivacea, DeN.	B.		
Argynnis ..	(Acidalia)..	hyporbius, Joh.	....	Chit.-Up B. Centr. I.	= niphe, L.	
			hybrida, Ev..	Nilgiris.		
			castetsi, ober.	Palni, Trav. Hills.		
			taprobana, M.	C		
	(Argynnis).	childreni, Gray.	....	Kum.-Up B.	....	The Nilgiri form of hyperbius seems to deserve a name and I propose *hybrida*; the male is similar to the Palni male in having the veins of the forewing dilated, but the female resembles the female of normal hyperbius, though smaller and paler.
			sakontala, Koll.	Chit.-Kum.		
		maia, Cr...	....	Chit., Gilgit.		
		kamala, M.	....	Chit.-Kum.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ —contd		NYMPHALINÆ—contd.				
Argynnis —contd.	(Argynnis) —contd.	laodice	.. rudra, M. ..	As.-Up. B.	.....	The Ladak form of jainadeva I separate as *pallida*. It is much paler and smaller than jainadeva.
		aglaia	.. vitatha, M...	Chit.-Kash.	.....	Vitatha is the name for the small pale form of aglaia occurring at high elevations (10,000 to 15,000') in Kashmir and Chitral. In the valleys at the Southern end of Chitral, particularly in the Ashreth Valley occurs a large form with a bright fulvous male; the female is darker and in some cases is entirely covered with dark purple scales (figured by DeN in J. B. N. H. S., XIV, 236) I propose the name *ashretha* for this form; it occurs at about 6,000 to 8,000 feet.
			ashretha, Ev	Chit.		
		adippe	.. jainadeva, M.	Chit.-Kum.		
			pallida, Ev...	Lad.		
	(Rathora)..	lathonia	.. issœa, Db. ..	Chit.-Up.B.		
	(Boloria) ..	gemmata, But.	....	Sik.		
		altissima, Et.	....	Sik.-Bhut.		
			mackinnoni, DeN.	Muss.		
		jerdoni, Lang.	....	Kash		
			chitralensis, M.	Chit.		
		pales	.. sipora, M. ..	Chit.-Sik.		
			generator, Std.	N. Kash.-Lahoul.		
		hegemone, Std.	....	Chit.-Lad.	.....	The Indian form of hegemone differs from Central Asia specimens but as there are only 3 specimens in the B. M. its separation is not justified.
		c'ara, Blanch.	....	Garhwal.		
			manis, Fruh	Sik.		
Melitæa	(Mellicta)	sindura, M.	....	Lad.-Kum.		
			balbita, M...	Kash	.....	balbita from Kashmir is a much larger and more brilliant race than sindura or sikkimensis, the Chitral form is as brilliant as balbita but is much smaller and the dorsal band is more complete: I propose to call it *balba*.
			balba, Ev. ...	Chit.		
			ikkimensis, M.	Sik		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
NYMPHALIDÆ —*contd.*		NYMPHALINÆ—*contd.*				
Melitæa —*contd.*	(Melitaea)	didyma ..	chitralensis, M.	Chit.	.....	The small Melitæa found in N. W. India, though variable, should stand as persea: the Chitral form, found at all elevations I call *mixta*, it is far more variable and usually more brightly coloured than persea. As mixta and chitralensis fly together and undoubtedly belong to separate species they cannot both be races of didyma.
		trivia ..	persea, Koll..	Bil.-Punj.	dodgsoni, Gr. S.; robertsi, But.	
			mixta, Ev. ..	Chit.		
		saxatilis ..	shandura, Christ.	Chit.	.....	Some years ago I sent Col. Bingham several specimens of a Melitæa from Chitral which he identified as saxatilis shandura Christoph: similar specimens have been arranged by Elwes in the B.M. as maracandica with a note "near ferghana, all are probably varieties of saxatalis." Seitz makes no mention of shandura and I have been unable to trace Christoph's description, but as my specimens were caught in the neighbourhood of the Shandur Pass I presume that they are identical with the form described by Christoph.
Byblia ..	....	ilythia, Drury.	....	Centr. I. S., C		
Ergolis ..	....	ariadne, Joh.	....	I. B. C.		
		merione, Cr.	....	N. I. B.		
			taprobana, Wd.	Centr. I. S. C.		
Laringa ..	....	castelnaui, Fd.	....	Ten.		
		horsfieldii..	glaucescens, DeN.	B.		
			andamanica, DeN.	An.		
Pseudergolis.	....	wedah, Koll.	.....	Kash.-B.	.....	Bingham places Cethosia between Cynthia and Atella: Seitz puts it in a "tribe" by itself, *viz.* Heliconidi after all the Nymphalidæ just before the Acræidi; it seems better placed near the Acræinæ than anywhere else.
Calinaga ..	....	buddha, M.	....	Murree.		
				Kulu.		
			gautama. M..	Sik.		
			brahma. But	As.		
		sudassana, Mel.	.....	B.		
Cethosia ..	....	cyane, Drury.	....	Muss-B.		
				Oriss.		
		hypsea ..	hypsina, Fd.	S. Ten.		
		biblis, Drury.	....	Sik.-B.	thebava, Gr. S. an ab.	
				(female v, viridiana, Fruh.)		
			nicobarica, Fd.	Ni.		
			andamanica, Stich.	An		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ —*concld.*		NYMPHALINÆ—*concld.*				
Cethosia —*contd.*	....	nietneri, Fd.	....	C.		
			mahratta, M.	S.		
		ACRÆINÆ.				
Pareba ..	....	vesta, Fab.	....	Chamba-B.		
Telchinia ..	....	violæ, Hüb.	....	I. C.		
		LIBYTHÆINÆ.				
Libythea ..	....	celtis, Fuess.	....	Chit.		
			lepita, M. ..	Kash.-Up.B.		
			lepitoides, M.	S. C.	.....	The 2 forms of myrrha are usually united and doubtless this is correct, but the wide banded form prevails in N. India and the narrow banded form in Ceylon: the forms may be seasonal.
		myrrha ..	rama, M. ..	Kulu.-B. S. C.	Myrrha, God. Java, Fruh. separates the N. form as sanguinalis.	
		rohini, Mar.	....	As.	? race of narina, God. Amboina.	
			libera, DeN. .	B.		
		geoffroyi ..	alompra, M. .	Ten.		
			(v. hauxwelli, DeN.)			
NEMEOBIDÆ.						
Dodona ..	....	durga, Koll.	....	Kash.-Nep.		
		dipœa, Hew.	....	Kulu.-As.		
		dracon, DeN.	....	Shan St.		
		eugenes, Bates.	....	Murree-As.		
		egeon, Db.	....	Kash.-As.		
		ouida, M..	....	Muss-Up.B.		
		adonira, Hew.	....	Nep.-Up. B.	.....	Longicaudata grades through deodata and binghami to angela: the material in the B. M. is very limited but I do not think that the last two are more than seasonal forms of deodata.
		deodata, Hew.	....	B.	= binghami, M., & angela, Gr. S.	
			longicaudata, DeN.	As.		
Zemoras ..	....	flegyas, Cr.	....	Muss-B.		
			confucius, Frnh.	Ten.		
Taxila ..	....	burnii, DeN	....	Up. B.		
		thuisto, Hew.	....	S. B.		
		haquinus..	fasciata, M...	B.		
Abisara .	....	fylla, Db..	....	Muss.-B.		
		neophron, Hew.	....	Nep.-B.		
		chela, DeN.	....	Sik.-As.		

(To be continued).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SOME MAYMYO BIRDS

BY

MAJOR H. H. HARINGTON.

PART II.

(Continued from page 1011 *of Vol. XX.)*

No. 25. *Garrulus leucotis*, Hume.—(The Burmese Jay.)

On the 10th April I visited the spot where last year I had been so fortunate with the Jays, and found the Colony still established in their old place; last year's nests being still there, and six new ones, I was unfortunately a few days too early as most of the nests only contained one or two eggs. Two nests were placed on stumps 3 and 4 feet from the ground, and eleven paces apart. I again visited my "Jay farm" on the 24th and was successful in getting some more eggs. Although I explored the jungle round Maymyo I never came across another colony; only finding single nests. Owing, no doubt, to the early rains this year, the Jays began nesting sooner than last year, when most of my nests were found in May.

No. 176. *Mixornis rubricapillus*, Tick.—(The Yellow-breasted Babbler.)

I did not see this noisy little bird actually in Maymyo itself, but on the 3rd May at Wetwun I found two nests with two and three incubated eggs. It is very partial to bamboo jungle, and if the locality is suitable its monotonous "Chuk, Chuk, Chuk" is generally to be heard.

No. 290. *Otocompsa flaviventris*, Tick.—(The Black-crested Yellow Bulbul.)

I did not come across this handsome Bulbul in Maymyo, but a few miles out on the Thondoung road and again at Wetwun it is very plentiful.

No. 515. *Oriolus tenuirostris*, Blyth.—(The Burmese Black-naped Oriole.)

This is the only Oriole I noticed round Maymyo, where it is extremely plentiful, many nesting in compounds. I found five or six nests both with eggs and young, and would probably have found more if I had tried, as they are extremely partial to nesting under the protection of Drongos of either kind. I noticed this more particularly in compounds, where if there happened to be a King-Crow's nest and any Orioles were heard in the vicinity, it was almost a certainty that their nest would be near that of the Drongo. Outside my gate I found both the Oriole and Red Turtle Dove (*Œ. tranquebarica* nesting in a tree next to that in which a pair of King-Crows (*D. ater.*) had theirs. As a further illustration a friend told me that he had a King-Crow's nest near his house, and on hearing an Oriole calling in the garden I said most probably the nest would be near that of the King-Crow, and sure enough on going to the clump of Oaks out flew an Oriole and we soon spotted the nest suspended a good bit below that of the King-Crow.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Last year I found a number of *Æ. tranquebarica* nesting in the proximity of nests both *D. ater* and *cineraceus*.

On my return to Mandalay I found a nest of (*O. tenuirostis*) in my compound containing two eggs, which were unfortunately on the point of hatching, and also noticed many other birds about. The majority of nests were placed from ten to twelve feet from the ground, one was, however, a good twenty-five feet up. The eggs are of the usual Oriole type, being very pink when fresh, becoming a dull white when well incubated. Average of six eggs 1·15 × ·86. Largest egg 1·2 × ·88, smallest 1·12 × ·86.

No. 935. *Pitta cucullata*, Hartz.—(The Green-breasted Pitta.)

Mr. T. Hauxwell caught one in his house and kept it alive sometime, feeding it on worms which it ate greedily.

No. 1178. *Scops bakkamœna*, Penn.—(The Collared Scops Owl.)

On the 27th March I found a nest containing 3 incubated eggs and secured the parent bird.

No. 1183. *Glaucidium cuculoides*, Vig.—(The Large Barred Owlet.)

Plentiful, heard and seen on several occasions.

No. 1212. *Spizaëtus limnaëtus*, Horsf.—(The Changeable Hawk-Eagle.)

Mr. Hauxwell procured a nest containing one young bird of this species and is bringing it up. I found the nest of either this or another Hawk-Eagle containing one young bird, which was left until it should get larger, but on my next visit I found the tree containing the nest had been blown down during one of the many storms we had this year at Maymyo. On two occasions when out with Mr. Hauxwell we saw what we took to be a pair of Black Eagles (*Ictinaëtus malayensis*) but could find no signs of their nesting.

No. 1221. *Butastur liventer*, Temm.—(The Rufous-winged Buzzard Eagle.)

Although this bird is fairly plentiful round Maymyo, I was only successful in finding one nest on the 15th April; this was an untidy affair placed on an overhanging bough and contained two fresh eggs. The habits of *B. liventer* in the Shan States seems to be totally different to those given in the *Fauna of India* for birds in Lower Burma, where they seem to be found in cultivated and open country, in fact having all the habits of the White-eyed Buzzard-Eagle (*B. teesa*) in Upper Burma. In the Shan States it seems to prefer open forest land and in Maymyo to be very partial to oak jungle. It is a very conspicuous bird with its bright chestnut upper plumage, and almost white underparts. *B. teesa* was seen in the open country to the west of the railway station.

No. 1251. *Baza lophotes*, Temm.—(The Black-crested Baza.)

On the morning of the 29th April, whilst birds nesting near the banks of the river at Wetwun, my attention was attracted by the noisy clamouring of a pair of Baza, who kept flying round a clump of trees, and settling side by side on a dead bough where they continued calling and raising their

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

crests, so it was clear they had a nest somewhere near. The cause of the disturbance seems to have been a troop of monkeys in the jungle below, which on our approach disappeared. Soon after this the birds quieted down, one going into the next tree where it settled on the nest, which was placed near the extremity of a branch, quite a hundred feet above ground, looking very like a large King-Crow's nest. I sent my Burmans up the tree to see if anything could be done; they fortunately managed to get above the nest and reported two eggs, also saying owing to the thinness of the bough it would be impossible to reach the nest; we then returned to the village to try and make arrangements. One of the Burmans produced a piece of black sticky bees' wax, and proceeded to demonstrate his plan, by picking up with the aid of the wax a large hen's egg at the end of a long bamboo. Our plan was then to use an old cap placed at the end of another bamboo as a receptacle which was to be placed alongside the nest, the eggs to be then lifted carefully into it. On our return the bird was still to be seen sitting on the nest; and after a little more practice with the hen's egg, the men went up the tree, whilst I anxiously waited below. The plan turned out quite a success, and both eggs were brought safely down. The next step was to procure one of the parent birds. This could easily have been done while the men were up the tree, but after the eggs had been taken both birds disappeared. One however (male) returned and was bagged for identification purposes. The Burmans reported the nest to be about a foot in diameter and lined with green leaves. The eggs which were well incubated are a dull chalky white and measure $1{\cdot}5 \times 1{\cdot}3$ and $1{\cdot}48 \times 1{\cdot}25$.

I think that *B. lophotes* is fairly plentiful in this part of the Shan States, as I saw one at Thondoung one evening sitting on a dead branch of a tree, and last year on the march up to Maymyo I saw a pair of birds in the jungle near where the Zig-Zag mounts the Ghats.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON BUTTERFLIES FROM THE NAGA HILLS.

BY

MAJOR H. C. TYTLER, 17TH INFANTRY.

(With Plate B.)

PART II.

(Continued from page 65 of this Volume.)

FAMILY—PAPILIONIDÆ.

188. **Armandia liddcrdali,** *Atkinson.*—Males not uncommon, females rare, at 5,500 ft.—7,000 ft. during the latter half of August, September and the first half of October. The first specimen was obtained on 19th August and the last on November 10th. Perfect males were only obtainable till about 20th September, after that the majority of the specimens were damaged. Most of the females taken were perfect. The butterfly though not uncommon is rather local and keeps to the higher ridges. Many specimens were captured on a white flowering tree which comes into blossom towards the middle of September. Two females after capture laid eggs which were yellow and appeared very small for the size of the insect. The flight is graceful and the insect is not difficult to capture when it occasionally comes down to within reach of the net, but as a rule it keeps high up amongst the tree tops.

189. **Leptocircus curius,** *Fabr.*—Taken commonly throughout the year at low elevations.

190. **Leptocircus meges,** *Zincken-Sommer.* Race, **indistincta,** n.—This differs from the Burmese form *Z. virescens,* Butler, and typical *Z. meges* from the Philippines in having on the underside of the hindwing the tornal area much greyer and the three white transverse bands blurred and not clearly defined.

Taken not uncommonly at 4,000—5,000 ft. from April to October and single male at Gaspani, 1,700 ft., in July.

191. **Teinopalpus imperialis,** *Hope.*—Many males taken at 7,000 ft. in September; no females were seen.

192. **Papilio cerberus,** *Felder.*—Not uncommon at the foot of the hills from March to August.

193. **Papilio æacus,** *Felder.*—Taken sparingly at the foot of the hills in March and June and at 7,000 ft. in August.

194. **Papilio aristolochiæ,** *Fabr.*—A few specimens taken at the foot of the hills in July and August and December.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

195. **Papilio astorion,** *Westw.*—Taken sparingly from March to November at the foot of the hills and at Kohima.

196. **Papilio aidoneus,** *Doubleday.*—Rather rare; three males taken at the foot of the hills and at Kohima in February, August and September.

197. **Papilio philoxenus,** *Gray.*—Taken commonly from April to October from the foot of the hills up to 7,000 ft. The variety *polymitis* was not met with.

198. **Papilio dasarada,** *Moore.*—Two males taken at low elevations in April and November and a female at Kohima in October.

199. **Papilio demoleus,** *L.*—Specimens taken at the foot of the hills from June to November.

200. **Papilio helenus,** *L.*—Common; small cold weather forms taken at the foot of the hills in February and large summer forms at 5,000—7,000 ft. from July to November.

201. **Papilio agenor,** *L.*—Taken sparingly at low elevations from March to November. Female forms *bullerianus*, Rothschild, and *alcanor*, Cramer, were obtained.

202. **Papilio protenor,** *Cramer.*—Males common; small cold weather forms taken at the foot of the hills in February and March, large rainy season forms from the foot of the hills up to 6,000 ft. from June to September. Females rather rare.

203. **Papilio rhetenor,** *Westwood.*—Small cold weather forms taken at the foot of the hills in March and April; large wet season forms taken at 5,000—6,000 ft. in September and October. Females very rare.

204. **Papilio chaon,** *Westwood.*—A single small cold weather form taken in February and several large wet season forms in August, all at low elevations.

205. **Papilio polytes,** *L.*—Common at the foot of the hills throughout the year and a few at 4,000 ft. in July and August; the female form *cyrus* Fabr., is decidedly rare.

206. **Papilio castor,** *Westwood.*—Males not uncommon at low elevations from July to September. A single female was taken.

207. **Papilio agestor,** *Gray.*—A single specimen taken in my garden at Kohima in May; several more were seen. I believe this form has not been recorded further west than Nepal but Captain Graham showed me a specimen in his collection which he informs me he captured himself at Simla.

208. **Papilio clytia,** *L.*—The *clytia* form was not obtained, but the *dissimilis* form was not uncommon at the foot of the hills from February to June.

209. **Papilio telearchus,** *Hewitson.*—Two males taken at Tamlu, 1,500—3,000, ft., and a male at Michuguard in August.

210. **Papilio danisepa,** *Butler.*—A single male of this beautiful and rare form taken at Tamlu in September and two more at Michuguard in June.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

211. **Papilio clophonor,** *Doubleday.*—Six males of this rare form were obtained at Tambu in August and several specimens near Michuguard in February, March and April.

212. **Papilio triumphator,** *Frühstorfer.*—Taken rather commonly at the foot of the hills and up to 7,000 ft., from February to October. The cold weather forms taken in February and April are very small.

Ab: *mai,* n.—Several curious aberrations of the cold weather form, taken in February and April, have the patch on the hindwing brilliant green instead of blue.

213. **Papilio paris,** *L.*—Very common throughout the year from the foot of the hills up to 6,000 ft. Specimens of the spring brood taken in February and March are much smaller than the summer brood and have the bright patch on the hindwing slightly greener.

214. **Papilio krishna,** *Moore.*—A battered specimen taken by Doherty (fide Elwes). I have not met with it in these hills but have taken many specimens in the adjacent hill of Manipur at 8,000 ft. in May.

215. **Papilio arcturus,** *Westwood.*—Not uncommon at 4,600—7,000 ft.; July to October.

216. **Papilio gyas,** *Westwood.*—Males not uncommon at 5,000—6,000 ft. from July to October. No females were obtained.

217. **Papilio sikhimica,** *Heron.*—Two males taken at about 2,000 ft. in April; one of these is a curious aberration and has on the forewing the fourth transverse black band from the base quite wanting and the second band broken in the middle.

218. **Papilio alcibiades,** *Fabr.*—Very common at the foot of the hills from May to August, a few were also taken in March and April. Neither Moore nor Bingham mentions the difference in the seasonal forms which is well marked. The early spring brood taken in March and April is smaller than the summer brood and has the markings much lighter; Bingham's description of *alcibiades* applies well to this form. The summer brood taken from May to August is larger and darker than the spring brood and has the terminal black margin on the forewing produced to vein 1, and sometimes beyond it touching the dorsum; the post discal band, which in the spring form never touches the marginal band and stops at vein 3 or before it, is prolonged and joins the marginal band at vein 2 or sometimes at vein 1, thus completely enclosing the submarginal greenish white band, approaching in this respect typical *antiphates,* Cr.

219. **Papilio antiorates,** *Doubleday.*—Appears to be single brooded. Common at the foot of the hills in April and a few specimens were also taken in May.

220. **Papilio axion,** *Felder.*—Not uncommon; taken at the foot of the hills from April to September.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BUTTERFLIES FROM THE NAGA HILLS.

Explanation of Plate B.

Fig. 1. Una usta, *Distant* ♂.

,, 2. Una usta, *Distant* ♀.

,, 3. Ilerda kohimensis, *n. sp.* ♂.

,, 4. Ilerda viridipunctata, *de. N.* Race Kala, *n.* ♂.

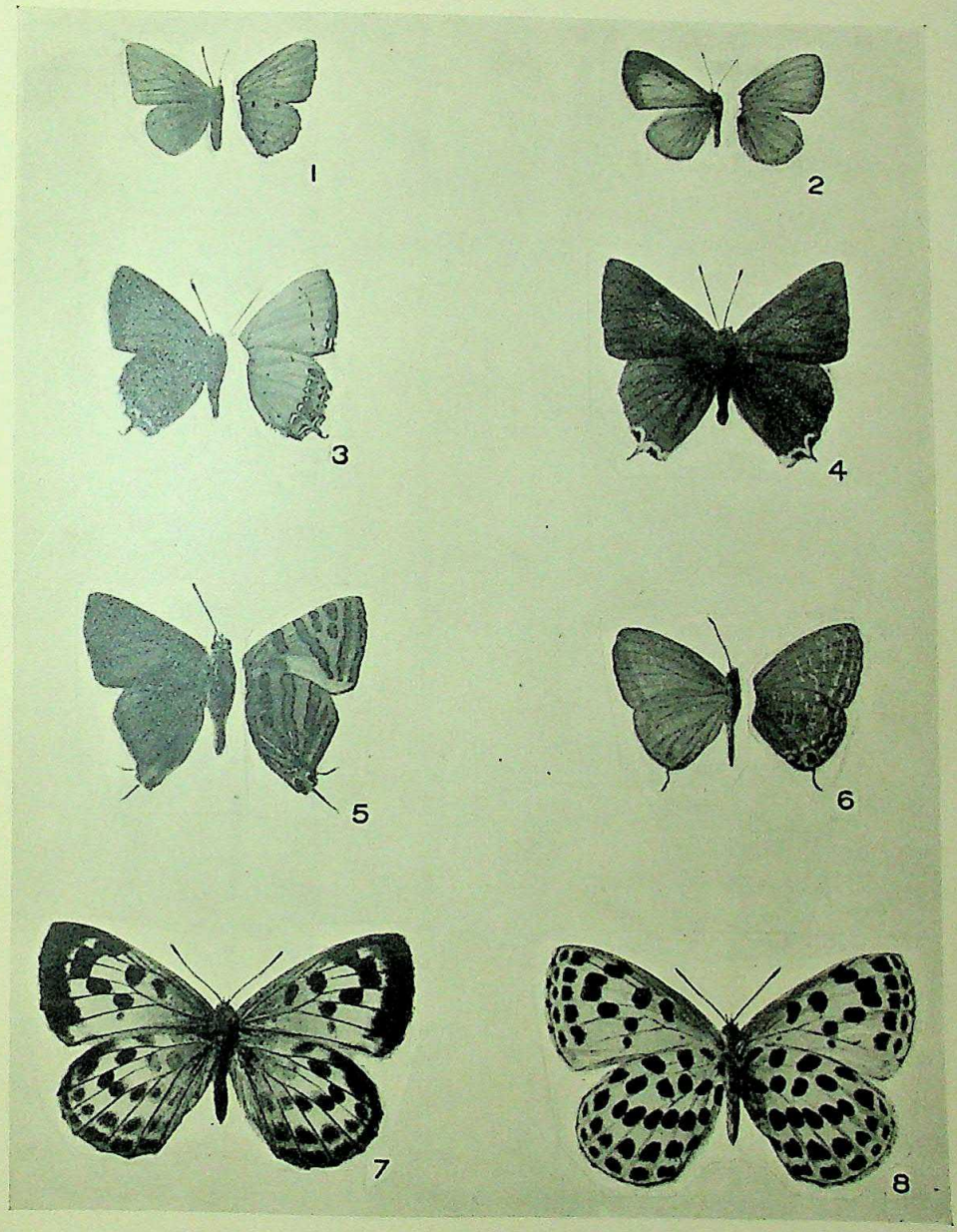
,, 5. Aphnæus?

,, 6. Lampides elpis, *Godart.* ab: Chinee, *nov.*

,, 7 & 8. Phengaris atroguttata, *Oberthür* ♀. Upper and underside.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



NAGA HILL BUTTERFLIES.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

221. **Papilio chiron,** *Wallace.*—Not uncommon near Tamlu in August; a male also taken near Michuguard in April.

222. **Papilio agamemnon,** *L.*—Common at the foot of the hills from February to August. A single specimen taken as high as 5,000 ft.

223. **Papilio cloanthus,** *Westwood.*—Not common, a few specimens taken at 1,700 ft. in March and at 5,000—6,000 ft. from May to September. The spring brood taken in March is much smaller than the summer brood. Specimens from these hills are somewhat larger than those from Garhwal in my collection.

224. **Papilio sarpedon,** *L.*—A very common butterfly; taken at the foot of the hills in February, July and August and at Kohima from July to September. The spring form taken in February is smaller than the summer form and has the blue bands on both wings somewhat broader.

225. **Papilio xenocles,** *Doubleday.*—A few specimens taken at the foot of the hills in May and August.

FAMILY—PIERIDÆ.

226. **Delias descombesi,** *Boisduval.*—A few specimens taken at 1,500—4,600 ft. in August and September.

227. **Delias aglaia,** *L.*—Very common at the foot of the hills and at Kohima in February, March and July to November.

228. **Delias thysbe,** *Cramer.*—Taken rather sparingly from the foot of the hills up to 5,000 ft. in February and August to November.

229. **Delias agostina,** *Hewitson.*—Not uncommon at 1,700—5,000 ft. from July to October.

230. **Delias ithiela,** *Butler.*—Very common at 4,000—7,000 ft. in August and September; a few specimens also taken in October.

231. **Prioneris thestylis,** *Doubleday.*—Males common, females uncommon. Dry season forms taken at the foot of the hills in April and at Kohima in October; wet season forms taken from the foot of the hills up to 5,000 ft. from May to October.

232. **Prioneris clemanthe,** *Doubleday.*—Not uncommon at Tamlu in August.

233. **Aporia agathon,** *Gray.*—A single male taken near Phiphima, 4,000 ft. in May.

234. **Pieris brassicæ,** *L.*—Rather scarce; two males and three females taken at Kohima in February, August and October. They do not differ from specimens from the N.-W. Himalaya except that in the female the discal spot on the forewing is joined to the black apical band by veins 3 and 4 being bordered with black, the area thus enclosed is powdered with black scales. I believe this butterfly has not been recorded further east than Bhutan.

235. **Pieris naganum,** *Moore.*—A single male of this rare butterfly was

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

taken by my collector in March between Kohima and Nichuguard, probably at the former place itself; unfortunately the exact locality was not written on the envelope.

236. **Pieris canidia,** *Sparrman.*—Abundant throughout the year from the foot of the hills up to 6,000 ft.

237. **Pieris moleto,** *Ménétriés.*—Rather uncommon, a few specimens obtained at 5,000—6,000 ft. in February, August and November.

238. **Huphina copia,** *Wallace.*—A single male of the intermediate form taken in April and two males of the dry season form (*H. dapatha*) taken in February. The wet season form was obtained in the neighbouring State of Manipur in August and September; all at low elevations.

239. **Huphina nadina,** *Lucas.*—A few specimens of both sexes taken at Kohima and Tamlu in August.

240. **Ixias latifasciata,** *Butler.*—Common; a very variable form. Two extremely small dry season forms with no black on termen of hindwing taken in February at the foot of the hills; typical wet season forms taken from September to November and intermediate forms in December at 2,000—6,000 ft.

241. **Appias nero,** *Fabricius.*—Not uncommon at low elevations; males taken in April, June, July and October. The colour is very variable, in some specimens it is orange, red and in other vermilion red.

242. **Appias hipro,** *Cramer.*—Common at the foot of the hills up to 5,000 ft.; April to October.

243. **Appias lalage,** *Doubleday.*—Rather common throughout the year from the foot of the hills up to 6,000 ft. Extreme dry season forms taken from January to March, large dark wet season forms from June to October, and intermediate forms in October and November.

244. **Appias albina,** *Boisduval.*—Rare; a single male taken at the foot of the hills in April and a female of the wet season form at Kohima in August.

245. **Catopsilia crocale,** *Cramer.*—Not uncommon; a few specimens of typical *crocale* taken at the foot of the hills is May and the form *catilla* taken from March to May and again in November.

246. **Catopsilia florella,** *Fabr.*—Common at Michuguard in February.

247. **Dercas lycorias,** *Doubleday.*—Recorded by Mr. Doherty as being rather common in June and disappearing in July (*fide* Elwes). I only obtained a pair, one in July and one in October.

248. **Colias fieldi,** *Ménétriés.*—Common in the Zulla valley 6,500 ft. in November and near Kohima July to October.

249. **Terias venata,** *Moore.*—Rather common at Kohima, August to October.

250. **Terias libythea,** *Fabricius.*—A few specimens taken at Kohima from February to August; not very common. Dry season forms taken in February have the cilia and edges of both wings pinkish.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

251. **Terias laeta,** *Boisduval.*—Very common at Kohima; dry season forms taken from January to May and again in November, wet season form taken in October.

252. **Terias hecabe,** *Linn.*—Very common throughout the year.

253. **Terias silhetana,** *Wallace.*—Not uncommon, August to November, at Kohima.

254. **Hebomoia glaucippe,** *L.*—Common at the foot of the hills up to 2,000 ft. from February to November.

255. **Pareronia avatar,** *Moore.*—A single male taken at 2,000 ft. in July and several males and three females at 5,000—6,000 ft. in August and October.

FAMILY—LYCÆNIDÆ.

Sub-family—GERYDINÆ.

256. **Gerydus irroratus,** *Druce.*—Recorded from the Naga Hills (*fide* Bingham).

257. **Allotinus drumila,** *Moore.*—A single female taken at Jaspani 1,700ft. in February.

258. **Allotinus multistrigatus,** *de N.*—Taken by Doherty (*fide* Elwes).

Sub-family—LYCÆNINÆ.

259. **Una usta,** *Distant.*—Pl. ii, fig 1 ♂, 2 ♀. Originally described from Malacca and has not I believe been previously recorded from within Indian limits. Four males were taken at Gaspani, 1,700 ft., in November and a female in February. I give a description of the female which is undescribed.

Upperside: Forewing, costa, apex and termen reaching the dorsum broadly dark brown, remainder of the wing sky blue; hindwing pale brown with a slight irroration of blue scales on the disc. Underside, pale silky buff; forewing unspotted; hindwing a small costal spot in interspace 7 and a small spot at the tornal angle, a sub-marginal row of pale fuscous spots hardly discernible. Expanse 1·02 inches. The absence of the spots, in the female, which are so conspicuous in the male may be due to seasonal causes as the specimen was taken in the height of the cold weather. The spot at the tornal angle of the hindwing in the female is absent in the males taken. In the plate there is a spot on the forewing of the female which is a flaw in printing.

260. **Pithecops hylax,** *Fabricius.*—Very common at Gaspani in February and March.

261. **Neopithecops zalmora,** *Butler.*—A single specimen obtained at 1,700 ft. in July.

262. **Taraka hamada,** *Druce.*—A single specimen taken in October 4,000—5,000 ft.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

263. **Mojisba malaya,** *Horsfield.*—Two specimens of the tailed form taken at the foot of the hills in April and May.

264. **Phengaris atroguttata,** *Oberthür.*—Pl. ii., figs. 7, 8 ♀. A single specimen of this beautiful species was taken by my collector at Yakama about 5,000 ft. either at the end of October or the beginning of November. A good number were taken by Doherty in the Kutcha Naga country from 6,000—8,000 ft. elevation.

265. **Cyaniris marginata,** *de N.*—Taken sparingly at Kohima from September to November.

266. **Cyaniris albocaerulea,** *Moore.*—Rather rare, a few males taken from August to November at 5,000—6,000 feet.

267. **Cyaniris transpecta,** *Moore.*—A single dry season male taken at Kohima in May; also a few specimens of both sexes of the wet season form from August to October.

268. **Cyaniris puspa,** *Horsfield.*—Very common; dry season forms taken from November to February and wet season forms from June to November.

269. **Cyaniris placida,** *de N.*—Many males taken at 5,000—6,000 ft. from July to September.

270. **Cyaniris diluta,** *Moore.*—Very common at 5,000 ft., September to January.

271. **Cyaniris jynteana,** *Moore.*—Very common. The seasonal forms vary considerably; typical wet season forms taken from June to October; intermediate forms from October to January and dry season forms from November to May.

273. **Bothrina chennelli,** *de N.*—This has previously been placed under the genus *Cyaniris*. Colonel Swinhoe pointed out to me that it differed from true *Cyaniris* in having veins 11 and 12 anastomosed; in *Cyaniris* they are free.

Not common, a few specimens taken at Kohima in February and October.

274. **Zizera maha,** *Kollar.*—Common throughout the year from the foot of the hills up to 6,000 ft.

275. **Zizera lysimon,** *Hübner.*—A single specimen taken at 2,000 ft. in April.

276. **Zizera otis,** *Fabr.*—Taken commonly at the foot of the hills in February, April and November.

277. **Lycaenesthes emolus,** *Godart.*—Males not uncommon at low elevations from March to November. A single female was obtained at Kohima in October.

278. **Lycaenesthes lycaenina,** *Felder.*—A single male at 1,700 ft. in October, and several males at Nichuguard during the same month.

279. **Talicada khasia,** *Druce.*—This is a well marked race of *T. nyseus*,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Guérin, very common at 6,000 ft. during October, a few also taken in September, November and December.

280. **Everes argiades,** *Pallas.*—Taken sparingly from August to November and again in February. This form varies much in size.

281. **Everes parrhasius,** *Fabr.*—A single specimen taken at Kohima in November and many specimens at Michuguard in October.

282. **Everes kala,** *de N.*—A couple taken at Maothana, on the Manipur frontier, 6,000 ft. in November, and many specimens of both sexes at Yakama from July to September.

283. **Nacaduba macrophthalma,** *Felder.*—Four males and a female taken from July to November from the foot of the hills up to 5,000 ft.

284. **Nacaduba bhutea,** *de N.*—Taken sparingly at low elevations in March, April and November.

285. **Nacaduba dana,** *de N.*—Two males in August and October at 4,000—6,000 ft. and several males at the foot of the hills in February.

286. **Nacaduba atrata,** *Horsfield.*—Males not uncommon at Kohima in June and August, females rare ; a single male also taken at 1,700 ft. in April.

287. **Nacaduba prominens,** *Moore.*—Two specimens in November, at 1,700 ft. This may be only a seasonal form of *M. atrata* from which however it can easily be distinguished by its more pointed wings and the markings on the underside being less pronounced.

288. **Nacaduba nora,** *Felder.*—Taken sparingly in March at 2,000 ft. and at Kohima in August.

289. **Nacaduba norcia,** *Felder.*—A female identified by Colonel Swinhoe as belonging to this form and figured in Lep. Ind. pl. 659, fig. 2a was taken at Kohima in November ; seven males also taken at Gaspani during the same month.

290. **Nacaduba coelestis,** *de N.*—Taken by Doherty in the Naga Hills but I have not met with it.

291. **Nacaduba hermus,** *Felder.*—A few males taken at Kohima in June and August and a single female in August at 7,000 ft.

292. **Lampides bochus,** *Cramer.*—Common from the foot of the hills up to 4,600 ft.

293. **Lampides cleodus,** *Felder.*—Rare, a single male of the wet season form taken at 1,700 ft. in October and a male of the dry season form at the foot of the hills in February.

294. **Lampides conferendi,** *Butler.*—Not common, taken at the foot of the hills in November and February.

295. **Lampides celeno,** *Cramer.*—Fairly common at the foot of the hills in April, October and November.

296. **Lampides elpis,** *Godart.*—Very common from the foot of the hills up to 5,000 ft. throughout the year. A very variable form which can however be divided off into four well marked groups.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(*a*) Typical wet season forms with the underside *grey brown* taken from April to October.

(*b*) An autumn form very similar to the wet season form but with markings on the upperside of the hindwing fainter and the colour of the underside *pale brown* taken in October and November.

(*c*) A winter form, smaller and paler than the autumn form, colour of the underside *yellow brown* with all the markings very faint and orange patch near tornus of hindwing almost absent, taken from November to February.

(*d*) A fourth form taken from November to April is very small and has the black on the termen of the forewing reduced to a thread and markings on the hindwing obsolescent ; on the underside it is exactly like the wet season form in having the ground colour *grey brown* and the orange patch near the tail of the hindwing well marked.

Ab., *chinee* nov. pl. ii, fig. 6.

This curious aberration of form (*d*) has the markings on the underside more or less ringed and those near the dorsum of the hindwing absent. A single specimen taken at the foot of the hills in April.

A male of form (*b*) has the colour of the upperside pure sky blue with no tint of purple as in typical forms.

297. **Catochrysops strabo**, *Fabricius*.—A few specimens taken at Kohima, August to November, and at the foot of the hills, October to January.

298. **Catochrysops lithargyrea**, *Moore*.—A few specimens taken at Kohima in July and at the foot of the hills in April and May. A very small and pale extreme dry season form male with markings on the hindwing almost wanting was obtained at Kohima in February.

299. **Tarucus plinius**, *Fabr*.—A single female at Kohima in August.

300. **Castalius ananda**, *de N*.—A single male at the foot of the hills in March.

301. **Castalius rosimon**, *Fabr*.—Common at the foot of the hills throughout the year.

302. **Castalius ethion**, *Doubleday and Hewitson*.—A few specimens taken at Kohima in October and at Nichuguard in July.

303. **Castalius elna**, *Hewitson*.—Taken sparingly at the foot of the hills from March to July.

304. **Polyommatus boeticus**, *L*.—Very common at Kohima, October to February, and at Michuguard in April.

Sub-family—CURETIÆ.

305. **Curetis bulis**, *Doubleday and Hewitson* :—A single male taken at Michuguard in May.

306. **Curetis dentata**, *Moore*.—Common at the foot of the hills. April and May.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

307. **Curetis angulata,** *Moore.*—Very common at Kohima from August to November, a single specimen also taken at Gaspani in November. There are three well marked seasonal forms.

(*a*) Wet season forms taken in August and September are very dark and have the basal area of the hindwing blackish.

(*b*) An autumn form taken from September to October has the red rather paler and the black at the base of the hindwing reduced to a streak between veins 7 and 8.

(*c*) Dry season forms taken in November have the red richer and darker than the autumn forms and no black at the base of the hindwing.

The above three forms are fairly constant, only a few specimens out of a large series were found to be intermediate.

308. **Curetis discalis,** *Moore.*—Taken commonly at the foot of the hills from April to July ; also a single specimen at 5,000 ft. in August.

Sub-Family—PORITIANÆ.

309. **Poritia geta,** *Fawcett.*—Four males taken in September and two in October near Kohima at about 4,000 ft. My native collector also sent me three females from Manipur.

Sub-Family—ARHOPALINÆ.

310. **Surendra quercetorum,** *Moore.*—Not uncommon ; taken at the foot of the hills and at Kohima from April to August.

311. **Arhopala pirithous,** *Moore.*—A male at 1,700 ft. in November and another at Nichuguard in February.

312. **Arhopala oenea,** *Hewitson.*—A single specimen at Nichuguard in February.

313. **Arhopala agaba,** *Hewitson.*—A male taken in July and another in September at 5,000 ft.

314. **Arhopala bazaloides,** *Hewitson.*—Two females taken at Kohima in October and November.

315. **Arhopala singla,** *de N.*—Common ; a couple of males taken at the foot of the hills in April and many specimens of both sexes at Kohima in January and February and also from July to November. Many specimens obtained were deep blackish purple and these I at first believed to be *A. bazalus,* Hewitson, but on shewing them to Mr. Bethune-Baker he identified both forms for me as *A. singla.*

316. **Arhopala fulgida,** *Hewitson.*—Six specimens taken at Gaspani in July and November.

317. **Arhopala arbegal,** *Doherty.*—Two specimens identified by Colonel Swinhoe as belonging to this species were taken in Gaspani in November.

318. **Arhopala diardi,** *Hewitson.*—Taken by Doherty in the Naga Hills. I have received it from the adjacent State of Manipur where it is not uncommon.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

319. **Arhopala hellenore,** *Doherty.*—Males taken commonly in my garden at Kohima from June to August and two females at 1,700 ft. in February and November. Both sexes seem to be very common in Manipur.

320. **Arhopala paramata,** *de N.*—Two males taken in February and June at Gaspani and Nichuguard.

321. **Arhopala perimuta,** *Moore.*—A female taken at Gaspani in April.

Sub-family—THECLINÆ.

322. **Zephyrus duma,** *Hewitson.*—A couple of worn males taken above Kohima at 7,000 ft. in September.

323. **Zephyrus sp.?** A single female of a form very near to *Z. syla* taken at Kirbari in the Zulla valley, 6,000 ft., in November.

324. **Ilerda epicles,** *Godart.*—Common at Gaspani in October and at the foot of the hills in June and July, a single male also taken in February.

325. **Ilerda kohimensis,** n. sp., Pl. ii., fig. 3. Male. *Upperside*: forewing, costa narrowly apex and termen broadly blackish brown, the remainder of the wing dull purple, this colour filling the cell and basal third of inter-space 6 and reaching the dorsum; hindwing, costa and termen broadly blackish brown, the remainder of the wing dull purple, three red lunules on the black terminal margin near the tornus, the upper one small and sometimes wanting.

Underside: forewing ochreous yellow, termen with a red marginal band commencing narrowly just below the apex and widening gradually as far as vein 2 and then continued to the tornal angle by a black streak bordered on both sides with white, another white streak above it on the inner margin of the red terminal band in interspace 2; a post discal series of blackish streaks in interspaces 1, 2, 3, 4, 5 and 6 very faint and sometimes wanting in the upper three; hindwing, ochreous yellow with a red terminal band powdered with white scales and bordered inwardly with white lunules with dusky edges and outwardly by a white line followed by a black thread both interrupted by the veins, the inner edge of this white line is bordered with a row of black triangular spots; a black spot in interspace 7 near the apex, one in the cell and another below it in interspace 1 and also one near the tornal angle; three post-discal white spots in interspaces 2, 4 and 5 the lower one the largest.

Cilia, black with a little white between the veins.

Antennæ, black ringed with white.

Female: *Upperside* blackish brown; forewing with a large post discal orange spot; hindwing with a terminal series of red lunules reaching the apex. *Underside*: as in male but somewhat paler and duller; hindwing without the subapical black spot.

Expanse 1·24 inches.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The male differs from *I. epicles* in having on the upperside the purple coloration more extended, covering nearly the whole of both wings, and of a duller shade; on the underside the yellow is purer. The female only differs on the upperside in having the red discal patch larger but as I secured only a single specimen of this sex this may not be constant; on the underside it is paler and duller. Mr. Bethune-Baker who kindly examined the genitalia for me writes:—

"I do not think they are the same (i.e., *I. epicles* and *I. kohimensis*). The *harpagines* (clasps) are practically similar but the other parts have distinct differences. The *tegumen* of yours has its lateral lobes quite twice as broad and they are somewhat curved and have conspicuous tubercles from which the hairs arise; whilst the *falces* (hooks) are angled about the middle; in *epicles* the *hooks* are narrow and straight and the *tubercles* quite inconspicuous, whilst the *falces* are evenly curved exactly like a sickle. In *yours* the *œdœagus* (penis sheath) is much longer and much more slender than in *epicles*; and again the *cingula* (girdle) is inclined strongly forward whilst in *epicles* it is nearly erect."

Fifteen males and one female were captured at 5,000—7,000 ft. from September to December. It is not nearly so common as *I. epicles* and flies at a much higher altitude.

I was at first inclined to think that this might only be a well marked local race of *I. epicles* but the differences in the genitalia point to it being quite distinct from that species.

326. **Ilerda androcles,** *Doubleday* and *Hewitson*.—Taken commonly at 4,600—7,000 ft. from August to November. This is the commonest Ilerda in these hills.

327. **Ilerda viridipunctata,** *de N.*—Race *kala*, n. Pl. ii., fig. 4. Under the above name I separate the form of *I. viridipunctata* found in these hills from the typical form found in Sikhim and the N.-W. Himalayas. On the upperside it differs in having the green powdery patch, which is so conspicuous in the typical form, reduced to a mere sprinkling of scales, hardly discernable in some specimens, giving the insect a very black appearance; these scales are also greener than in the typical form.

Mr. Elwes records it as being common in the Naga Hills at 6,000 ft. and above. I only obtained it in November at 5,000—6,000 ft. when it was rare owing probably to the lateness of the season.

328. **Ilerda brahma,** *Moore*.—Very common at 5,000—7,000 ft. from August to November; a few specimens which are somewhat smaller were taken in March at 4,000 ft.

Aberration *hybrida*, n.

Very similar to typical *I. brahma* but differs in the colour being brassy green and the terminal red band on the hindwing narrower.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I have placed this form as an aberration of *I. brahma* but it may be a hybrid or even a distinct species. In colouring it is intermediate between *I. androcles* and *I. brahma*. I obtained two specimens, one taken by myself at 4,400 ft. and another taken by my collector at 7,000 ft. In the de Niceville collection, now in the Calcutta Museum, there is a specimen of this form, placed amongst *Ilerda viridipunctata* which may be one of the two sports or hybrids referred to by him in his "Butterflies of India, vol. iii, p. 339" and which he thinks may possibly be a hybrid of *I. brahma* and *I. viridipunctata*; if this form is a hybrid at all it is more likely to be one of *I. brahma* and *I. androcles* as the extent of the coloring and the character of the scales agrees with these two species whereas in *I. viridipunctata* the colour is restricted and the scales have a powdery appearance, and these characters would to a certain extent be indicated in the hybrid while they are not in the present form.

329. **Camena ctesia,** *Hewitson.*—Common at 5,000 ft. from July to December, two males also taken, at the foot of the hills in May and July.

330. **Tajuria maculatus,** *Hewitson.*—A single male taken at Gaspani in March.

331. **Tajuria illurjis,** *Hewitson.*—A single male at 5,000 ft. in September.

332. **Aphnæus syama,** *Horsfield.*—Very common at the foot of the hills. Rainy season forms taken from August to November and dry season forms in November and March.

333. **Aphnæus lohita,** *Horsfield.*—Common at Kohima and up to 7,000 ft. from June to October; also a few specimens obtained at the foot of the hills from February to July.

334. **Aphnæus khurdanus,** *Moore.*—I do not know if I have identified this insect correctly; the male is like *A. ictis* but without any orange spot. The female is a good deal larger than the male and has a Y shaped red post discal patch and has the basal area of the forewing speckled with bluish grey; these scales also appearing sparsely on the dorsal half of the hindwing, being most numerous near the tornal angle.

335. **Aphnaeus sp.** Pl. ii., fig. 5.—Four males of an *Aphnæus* were taken between 4,000 ft and 6,000 ft. in September and October which do not quite agree with any form in the "Butterflies of India." The underside agrees with the description of *A. suni* but the upperside has no red discal spot. Mr. Elwes in P. Z. S. 1892, p. 638, describes and on pl. 43 (6) figures a female *Aphnaeus* from the Karen Hills which agrees with my males on the underside and in the coloring of the anal lobe on the upperside, and appears to be the female of this form. I showed it to Colonel Swinhoe who pronounced it to be *A. peguanus*, Moore; de Niceville seems to think *A. peguanus*=*A. syama* and is the dry season form of it.

Whatever the present form is, it certainly is not the dry season form

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of *A. syama* which I took commonly and from which it can be at once distinguished by the deeper colour of the blue on the upperside and on the underside by the hook shaped streak in the cell. The forewing is also of a different shape and more pointed. The two insects when placed side by side look totally different.

336. **Aphnaeus rukmini**, *de N.*—A single male taken at the foot of the hills in April.

337. **Hypolyæena erylus**, *Godart.*—Males very common at the foot of the hills from March to November. Females rather rare.

338. **Chliaria othona**, *Hewitson.*—Three males obtained at the foot of the hills from March to August.

339. **Chliaria kina**, *Hewitson.*—Three males taken at Kohima in October, also four males and two females bred from larvæ. I give the transformations from larva to imago.

At Kohima on 25th September 1909 an orchid, *Vanda cœrulea*, was brought to me. On it feeding on the flowers were seven larvæ. On 27th and 28th four larvæ left the flowers and descended to the leaves of the orchid where they lay quietly on the upper surface of the leaves, three on one leaf and one on another; here they lay without moving till they pupated which two did on morning of 29th, one on the evening of the same date and one on the morning of the 30th. Two more left the flowers on 30th September and 1st October and pupated on the flower stem at its base close to the leaves. The seventh died.

The positions chosen seemed to be immaterial as some had their heads downwards and some up.

Larvæ when full grown were about ·64 inches in length and of the usual onisciform shape. Colour pale green with dorsal spiracular, super-spiracular and sub-spiracular reddish mauve bands, all with the exception of super-spiracular coalescing near 11th and 12th segments; the dorsal band could be distinctly seen to expand and contract with the breathing. 11th to 14th segments entirely reddish mauve. Head pale greenish yellow with black eyes and when at rest drawn in under 2nd segment. Spiracles black ringed faintly with yellowish; prolegs tinged with reddish mauve: four dark dorsal dots on 2nd segment; a gland on dorsum between 11th and 12th segments exuding a crystal liquid eagerly sought after by attendant ants; the ant tickles the larva until it exudes a drop of liquid which it immediately drinks up. The whole of the upper body covered with short dark hairs.

Whilst preparing for transformation to the pupal stage the reddish mauve colour of the larva diminishes in intensity and when the larval skin is cast off the colour of the pupa is pale green with the mauve stripes showing faintly. The pupa lies flat on the upper surface of the leaf or on the side of the raceme to which it is attached by the cremaster to a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

silken pad previously spun and is held in position by a fine thread round the 5th segment attached to the leaf on both sides of the body.

The pupa which has a decided dip between the thorax and abdomen is about ·43 inches in length. By degrees the colour of the pupa changes and just before the imago emerges it becomes dark-brownish green. One imago, a male, emerged on 11th October, another male on 12th, a third male and two females on 14th and a fourth male on 16th.

340. **Zeltus etolus,** *Fabr.*—Very common at the foot of the hills up to 1,700 ft. from March to November: females rather rare, only three being obtained.

341. **Cheritrella truncipennis,** *de N.*—A single male taken on a peach tree in my garden at Kohima on 21st November.

342. **Cheritra freja,** *Fabricius.*—A male and two females taken at Gaspani 1,700 ft. in August and November.

243. **Ticherra acte,** *Moore.*—Two females of the dry season form taken at Nichuguard and Gaspani in February and two females of the wet season form in July and October.

344. **Catopæcilma elegans,** *Druce.*—Two males taken at Gaspani in March.

345. **Loxura atymnus,** *Cramer.*—Common from the foot of the hills up to 1,700 ft., April to October.

346. **Gasada tripunctata,** *Hewitson.*—Rainy season forms taken in May and June and dry season forms in November and December.

347. **Deudorix epijarbas,** *Moore.*—Two females taken at 5,000 ft. at the end of October and the beginning of December.

348. **Rapala schistacea,** *Moore.*—Taken not uncommonly in my garden at Kohima in October and November.

349. **Rapala varuna,** *Horsfield.*—A single female taken at Nichuguard in June.

350. **Rapal buxaria,** *de N.*—I am not sure if I have identified this form correctly. It closely resembles the next form with which it flies, from which however it can be distinguished on the upperside by entirely lacking the orange spot and by the blue of the discal area, which is of a slightly different shade, not entering the cell: in all specimens of *R. nissa* taken in these hills the blue enters the cell. On the underside the transverse bands on both wings are narrower and straighter.

351. **Rapala nissa,** *Kollar.*—Very common at Kohima throughout the year. Cold weather forms taken from December to February are much smaller than the wet season forms and have a purple sheen on the underside; the orange spot on the forewing is much larger and the spot above the tail on the underside of the hindwing is very small. This eastern form of *R. nissa* differs from the N.-W. Himalayan form in being larger and having the blue colouration on upperside richer and deeper. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

colour on the underside in the wet season forms is a richer yellow brown which in the dry season forms is suffused with reddish purple.

352. **Rapala jarbas,** *Fabr.*—Rather common at Kohima and Gaspani in October and November.

353. **Rapala xenophon,** *Fabr.*—A single male taken at Nichuguard in February.

354. **Bindhara phocides,** *Fabr.*—A male was taken by Doherty. A single female was taken by my collector at 5,400 ft. in August.

355. **Virachola perse,** *Hewitson.*—A single male taken at Gaspani in October.

356. **Sinthusa virgo,** *Elwes.*—Mr. Doherty obtained a female.

FAMILY—HESPERIADÆ.

Sub-family—HESPERIANÆ.

357. **Celænorrhinus pero,** *de N.*—Taken by Doherty.

358. **Celænorrhinus pulamaya,** *Moore.*—Three specimens taken at 5,000 ft. in August.

359. **Celænorrhinus aspersa,** *Leech.*—Not common, taken at 5,000—7,000 ft. in August and October.

360. **Celænorrhinus sumitra,** *Moore.*—Obtained by Doherty.

361. **Celænorrhinus leucocera,** *Kollar.*—Three specimens taken in September.

362. **Celænorrhinus maculicornis,** *El* and *Ed.*—A pair taken at Kohima, 4,000—5,000 ft.

363. **Celænorrhinus chamunda,** *Moore.*—A single male taken at 7,000 ft. in September.

364. **Celænorrhinus aurivittata,** *Moore.*—Taken by Doherty.

365. **Sarangesa dasahara,** *Moore.*—Several specimens taken at Gaspani and Nichuguard in October and November.

366. **Coladenia dan,** *Fabricius.*—A few specimens taken at Kohima in September and October and commonly at Nichuguard in the latter month.

367. **Coladenia agnioides,** *El. and Ed.*—The type was obtained by Doherty in the Naga hills; it must be very rare.

368. **Satarupa phisara,** *Moore.*—Two males at Gaspani in February and March.

369. **Tagiades khasiana,** *Moore.*—Several specimens taken at the foot of the hills in October.

370. **Tagiades menaka,** *Moore.*—Taken commonly, May to October, from the foot of the hills up to 5,000 ft.

371. **Tagiades atticus,** *Fabricius.*—Two specimens taken in July at the foot of the hills.

372. **Odontoptilum sura** *Moore.*—Common at the foot of the hills in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

March, April and October; a single specimen also taken at 5,000 ft. in August.

373. **Astictopterus olivascens,** *Moore.*—Two males taken at Kohima in August and a female at Nichuguard in July.

374. **Astictopterus henrici,** *Holland?*—I am not sure if I have identified this species correctly. A single specimen taken at the foot of the hills in April agrees fairly well with Elwes' figure, T. Z. S. Vol. XIV, part 4, plate XVIII, figure 16, but has only two dots on the forewing and the apices of both wings are very much pointed.

375. **Sancus pulligo,** *Mabille.*—A single male taken at Nichuguard in February and both sexes taken in large numbers in October and November.

376. **Suada swerga,** *de N.*—Two specimens obtained at Nichuguard in March.

377. **Iambrix salsala,** *Moore.*—Very common at the foot of the hills in October.

378. **Ochus subvittatus,** *Moore.*—Very common at Kohima and at the foot of the hills from July to October.

379. **Ampittia maro,** *Fabr.*—A single specimen taken at Kohima in September.

380. **Aeromachus stigmata,** *Moore.*—Two males and a female taken at Kohima in August and many males in September.

381. **Aeromachus kali,** *de N.*—Five males taken at 5,000 ft., July and September.

382. **Sebastonyma dolopia,** *Hewitson.*—Two specimens taken in June at Nichuguard.

383. **Pedestes pandita,** *de N.*—Many specimens taken in August and September at Kohima.

384. **Hyarotis adrastus,** *Cramer.*—Taken at Nichuguard in March.

385. **Arnetta atkinsoni,** *Moore.*—A few specimens taken at the foot of the hills in March, May and August.

386. **Scobura cephaloides,** *de N.*—Taken by Doherty.

387. **Erionota thrax,** *L.*—A pair taken at Kohima in August and October. One of these was taken in my bungalow after dinner and evidently came in attracted by the light.

388. **Kerana diocles,** *Moore.*—A few specimens taken at the foot of the hills in March, July and October.

389. **Plastingia margherita,** *de N.*—Taken by Doherty.

389A **Pithauria stramineipennis.**—*W. M.* and *de N.*—Two specimens taken at the foot of the hills in March and October.

390. **Pithauria murdava,** *Moore.*—A single specimen taken at Nichuguard in June.

391. **Notocrypta feisthamelii,** *Boisduval.*—Common at Kohima, August to December; a single specimen taken at Gaspani in March.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

392. **Notocrypta restricta,** *Moore.*—Common at Kohima, August to October, and at the foot of the hills in March.

393. **Udaspes folus,** *Cramer.*—Taken commonly at Kohima in August.

394. **Augiades siva,** *Moore.*—A single male taken at 5,000 ft. in September.

395. **Telicota bambusae,** *Moore.*—Taken commonly at the foot of the hills in February, March and July.

396. **Telicota dara,** *Kollar.*—Common from the foot of the hills up to 5,000 ft. throughout the year.

397. **Telicota maesoides,** *Butler.*—Taken commonly at Gaspani in February and March.

398. **Halpe zema,** *Hewitson.*—Three specimens taken in March, June and October.

399. **Halpe hyrie,** *de N.*—Taken by Doherty.

400. **Halpe sikhima,** *Moore.*—Taken by Doherty.

401. **Halpe honolea,** *Hewitson.*—Taken by Doherty.

402. **Halpe separata,** *Moore.*—Four specimens taken in August.

403. **Parnara occia,** *Hewitson.*—Two males taken at the foot of the hills in February and November.

404. **Parnara sinensis,** *Mabille.*—Taken commonly from the foot of the hills up to 5,000 ft. in January, March and August.

405. **Parnara kumara,** *Moore.*—A single specimen at Gaspani in February.

406. **Parnara pagana,** *de N.*—A single specimen at Kohima in August.

407. **Parnara guttata,** *Br.* and *Gr.*—Taken at Kohima in August but not commonly.

408. **Parnara contigua,** *Mabille.*—Very common at the foot of the hills in February and March.

409. **Parnara eltola,** *Hewitson.*—Very common at Kohima, and the foot of the hills, March to October.

410. **Parnara bevani,** *Moore.*—Taken commonly from the foot of the hills up to 5,000 ft., January to October.

411. **Parnara assamensis,** *W. M.* and *de N.*—A few specimens taken at the foot of the hills in April, May and November and at 4,000—6,000 ft. in April and October.

412. **Ismene jaina,** *Moore.*—Several males taken at 5,000 ft. in August and September.

413. **Ismene harisa,** *Moore.*—Two specimens taken at the foot of the hills in March and October.

414. **Ismene vasutana,** *Moore.*—Common at Kohima, August to October.

415. **Ismene amara,** *Moore.*—A single specimen taken at Nichuguard in June

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

416. **Ismeno gomata,** *Moore.*—A single specimen taken at 6,000 ft. in October.

417. **Hasora badra,** *Moore.*—A single specimen taken at Nichuguard in October.

418. **Hasora chabrona,** *Plotz.*—Taken at the foot of the hills in May and November and at Kohima in September.

419. **Hasora chromus,** *Cramer.*—A single male at Nichuguard in May.

420. **Hasora chuga,** *Hewitson.*—Taken by Doherty.

421. **Bibasis sena,** *Moore.*—A pair taken at Kohima in September and November and a male at Gaspani in October.

422. **Badamia exclamationis,** *Fabr.*—Not uncommon at Kohima, August to November.

423. **Rhapalocampta benjamini,** *Guerin.*—Several males and a single female taken at Kohima from July to September. One of the males has the same bluish colour as in the female.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

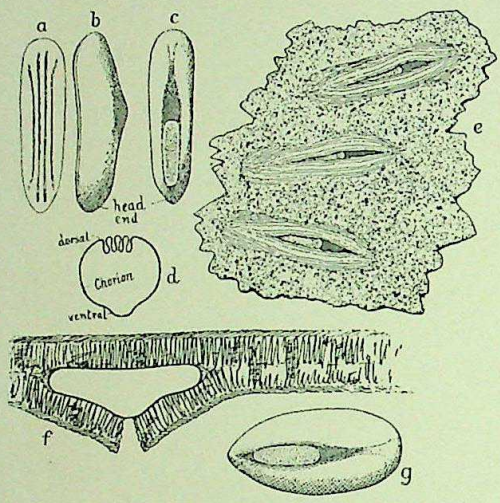


Fig. 1.

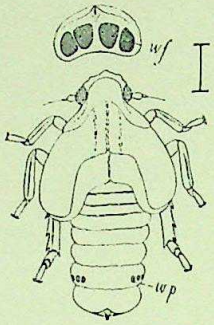


Fig. 2.

Fig. 4.

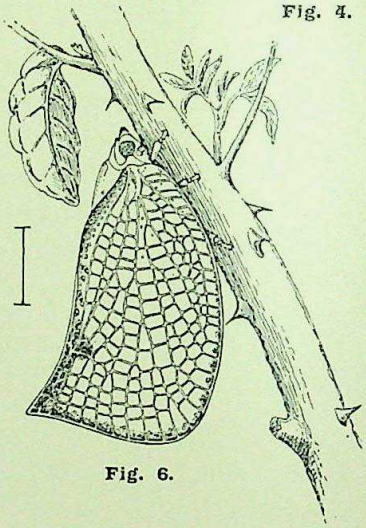


Fig. 6.

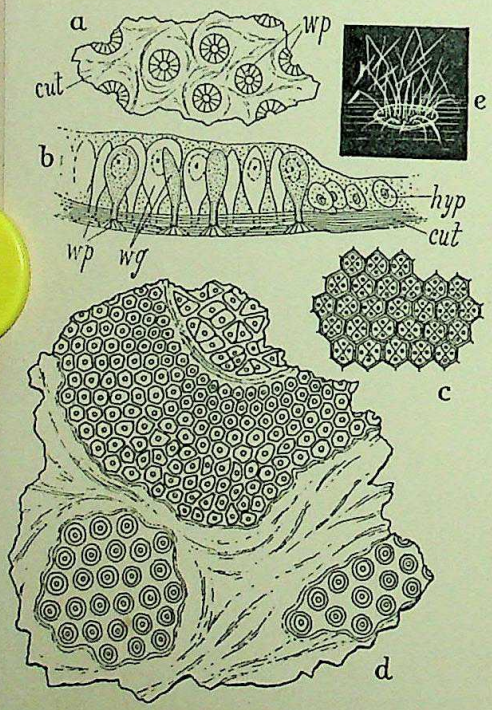


Fig. 3.

Description of Plate A :—

FIG. 1.—a = dorsal; b = side; c = ventral view of egg of *Salurnis marginellus*, Guerin; d = transverse section of egg in ovary; e = underside of portion of leaf in which three eggs are laid; f = transverse section of egg in leaf; g = ventral view of egg, taken out of a leaf.

FIG. 2.—Nymph of *Geisha distinctissima* after fourth moult; view of end of abdomen above: *wf* = wax-field; *wp* = wax-pit.

FIG. 3.—a = looking on exterior of portion of cuticle of wax-field of *Nemelicharia furtiva*, Melichar: *wp* = wax-pit; b = section through the wax-field: *wg* = wax-glands; *wp* = wax-pits; *hyp* = hypodermic cells; *cut* = cuticle; c = looking on exterior of portion of cuticle of wax-field of *Geisha distinctissima*; d = looking on exterior of portion of cuticle of wax-fields of *Salurnis marginellus*; e = one of the dorsal wax-pits of *Geisha distinctissima*, showing wax-spicules re-forming after being wiped off.

FIG. 4.—Nymph of *G. distinctissima* with *Dryinid* parasite under right wing-pad.

FIG. 6.—Adult female of *Salurnis marginellus*.

(All the figures are much magnified.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON FLATA.

BY

J. C. KERSHAW, F.Z.S., F.E.S.

(*With Plates A & B*).

Three species of Poekillopteridæ or Flata are here discussed, *viz.*:—*Salurnis marginellus*, Guerin, and another rather larger species, *Geisha distinctissima*, Walk., both from South China; also *Neomelicharia furtiva*, Melichar, from North Queensland. Both *Geisha* and *Salurnis* feed in all instars on many plants, but their favourite foodplant is *Xanthoxylum nitidum*, D. C., N. O. *Rutaceæ*, an exceedingly common and very prickly half-climbing shrub. One species is also fond of the small tree *Heptapleurum octophyllum*; Hance, N. O. *Araliaceæ*.

The female of *Salurnis marginellus* is provided with a pair of hard, chitinous saws (s, fig. 5) with which she cuts a slit in the undersurface of a leaf, or in the bark of stems. An egg is then inserted in the slit (e, fig. 1) together with a little colleterial fluid, so that the leaf tissues adhere firmly to the chorion of the egg. No white matter or wax is deposited on the embedded egg, but a very tiny portion of which is visible through the slit in the leaf, and then only with a lens. The eggs produce very slight protuberances on the leaf surface, and are laid singly, though sometimes two or three may be found in different parts of the same leaf or stem. The length of the eggs is about 1·4 mm.

Whilst in the ovary the eggs are circular in transverse section, with four deep longitudinal invaginations of the chorion on the dorsal surface, showing on the exterior of the egg as narrow lines, and working out to nothing at head and tail (a, b, c, d, fig. 1). When the egg is laid, however, it becomes in transverse section shallow and exceedingly broad, and with the expansion of the egg these invaginations totally disappear (g, fig. 1). The portion of the chorion which forms the long, narrow lid, and faces the slit in the leaf, is of different sculpture to the rest of the egg, which is impressed by the ovarian epithelial cells with the usual more or less hexagonal reticulation. The object of this curious provi-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

sion for expansion seems to be to allow the egg, after being laid in the slit in the leaf, to expand sideways into the cavity and thus take up less space in the slight thickness of the leaf: besides allowing the cut edges of the slit to close upon and protect the egg (f, fig. 1).

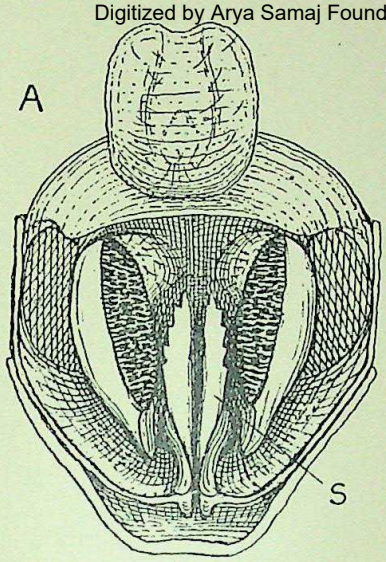
The nymphs are broad and flat and, except for the growth of the wings, very similar in all instars; they are chiefly of a dull white. Their powers of jumping are highly-developed and they can spring great distances, even when recently hatched. The nymphs usually feed on the underside of fresh leaves, or on the stems of new shoots. Those of both *Geisha* and *Saturnis* emit a white, waxy material in great quantity; but whilst the nymph of the larger species lives almost covered by the white, flocculent material, the nymph of *S. marginellus* extrudes most of the matter in two long streamers from the anal segment. Some of this white substance instantly dissolves in spirit and melts with heat, and is of a waxy nature, but a large part consists of hollow filaments or hairs, much broken and interlaced, insoluble in either spirit or potash; apparently much resembling in chemical nature the wax-hairs which project from the anal segments of certain leaf-hopper nymphs.

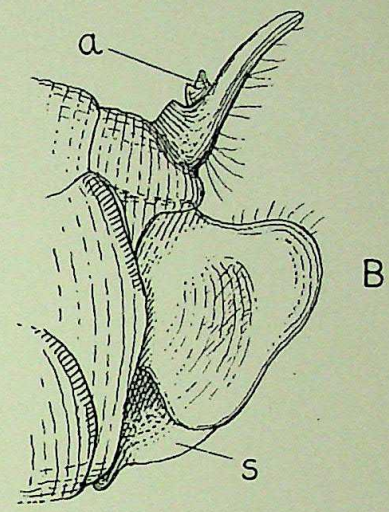
In the nymph of *Geisha* there are ten small circular wax-pits or fields (wp, fig. 2), five on either side of the seventh abdominal segment, showing yellowish when the wax is removed. Only three of these wax-pits appear on each side in fig. 2, the others being below but in the same line. If, whilst the nymph is living, the wax is brushed away from these pits, the wax-spicules are seen forming again immediately, and enough is soon emitted to again more or less cover the insect (f, fig. 3). But there are much larger wax-fields on the end of the abdomen in both species, as shown at w. f. fig. 2., which represents a nymph of *Geisha* after the fourth moult. The cuticle of these wax-pits and fields is curiously fretted and pierced for the innumerable tiny unicellular wax-glands (fig. 3). These glands are modified and enlarged hypodermis cells; secreting the wax through the fretted areas of the cuticle (a and b fig. 3, from nymph of Australian species). In some species of *Flata* this fretting is rather rough and simple; in some it is highly ornate and intricate: most species have at least

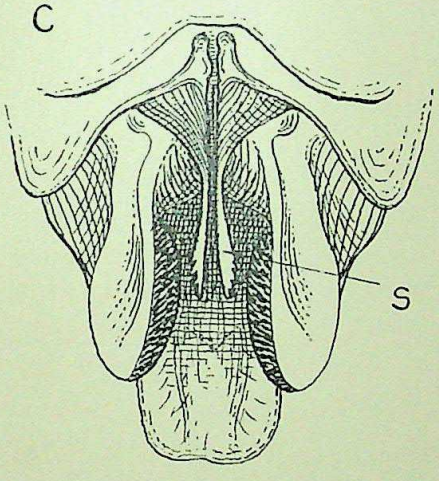
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

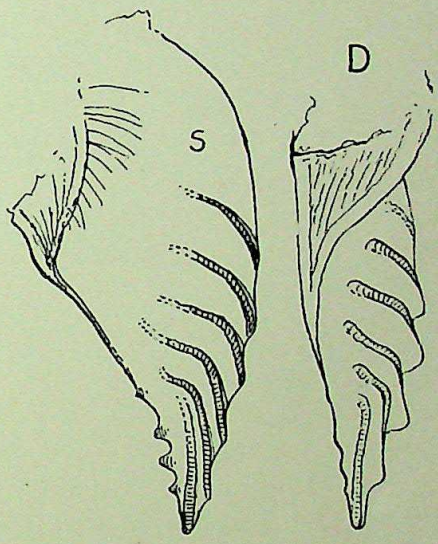
Digitized by Arya Samaj Foundation Chennai and eGangotri

Fig. 5.









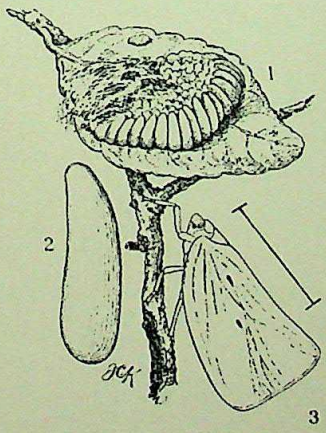


Fig. 7.

Description of Plate B:—

FIG. 5.—A = end view of end of abdomen of *Saturnis marginellus*.
B = side view.
C = view from underside.
D = two views of the "saws."
a = anus.
s = saw.

FIG. 7.—*Neomelicharia furtiva*.
1 = Egg-batch on leaf.
2 = Egg.
3 = Adult female.

(All the figures are much magnified.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

two different patterns of fretting on the same individual, and even on the same wax-field, as shown at e, fig. 3; and again the frettings on the cuticle of the anal areas differ from that of the wax-pits on the dorsal segments (c and d, fig. 3). The glands themselves, however, all appear to be of the same type, though differing much in size. The wax-glands of the Chinese Candlefly, (*Pyrops candelaria*), a large *Fulgorid*, are very similar to these *Flatid* glands. It will be seen from fig. 3 that each little pit in A and B has but one gland discharging through it; whereas in C and D each area has four openings for glands, which, however in this instance, are much smaller; they are, moreover, practically divided off from one another, as shown.

The nymphs of *Geisha* and *Salurnis*, which may happen to be hatched late in the Autumn, rest during the dry season, feeding but little; and often creep for shelter from cold between leaves secured together by spiders, ants or lepidopterous larvæ. These nymphs moult to adults at the beginning of the wet season. The *Flatas* are nocturnal, usually remaining motionless on a leaf or stem during the day, but becoming active and flying about at dusk and during the night, when they couple and oviposit. These two species of *Geisha* and *Salurnis* are, as a rule, solitary, though several may sometimes be found on the same bush. The nymphs of the larger species are much infested by a *Dryinid* parasite, which appears as a black, circular, flat sac beneath one of the wing-pads (fig. 4); but it is not uncommon in South China to find a parasite under each wing-pad.

The Australian species of *Flata* here mentioned—*Neomelicharia furtiva*—is gregarious, and has the common *Flatid* habit of many individuals sitting in line close together along a twig or branch. This species oviposits in quite a different manner from *Salurnis marginellus*, since it lays its eggs in a large batch on the surface of leaves, often on the upperside, and the batches are usually thickly covered with the white waxy matter. The female is not provided like *Salurnis* with "saws" for cutting leaf tissues. This *Flata* is a pest on orange and lemon trees in Queensland, which are often loaded with the insect in all instars during the wet season.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE OOTHECA OF AN ASILID.

BY

J. C. KERSHAW, F.Z.S., F.E.S.

(With Plates A and B).

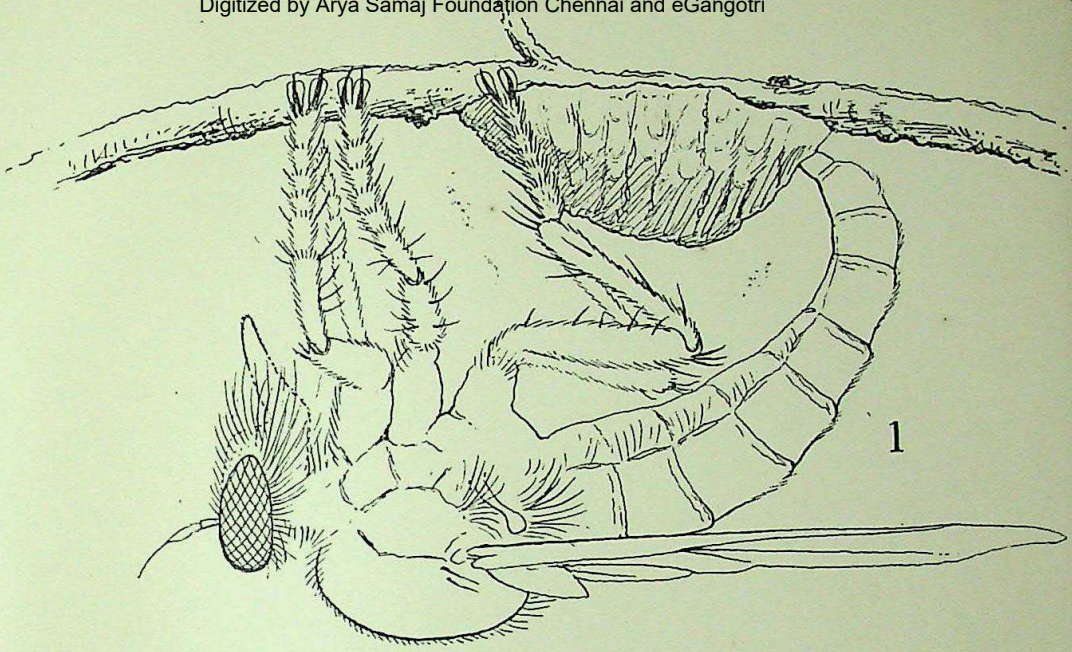
The ootheca of this *Asilid** (*Promachus*, sp.), which is very common in Kwangtung Province, S. China, is affixed to the upper end of long, coarse grass-stalks, the bare ends of twigs of woody herbs and such-like situations, usually two or three feet above the ground. Where the flies are numerous—along hedge-rows on the outskirts of woods and patches of vegetation—these egg-cases may be found in dozens during May and June, the flies constructing them having emerged about the end of April. The male is easily distinguished from the female (even on the wing) by the patch of pure white hairs on the dorsal surface of the end of the abdomen; the total length of the fly is about one inch, and the ♀ is usually the larger. When about to couple—the ♀ generally sitting quietly on a leaf or twig—the ♂ hovers for a few moments like a *Syrphid*, about a foot above and a little in front of and facing the ♀. He then suddenly darts down on her, and coupling is immediately effected. They remain *in coitu* several hours, end to end, the ♀ often feeding meanwhile, as is the habit of the *Asilidæ*. There are one or two smaller species in Kwangtung, probably of the same genus, which construct similar but smaller egg-cases.

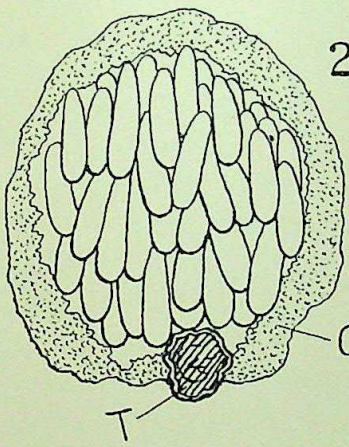
The species here noted was observed making its ootheca in the middle of May, on the underside of a stout tendril of a shrub about four feet from the ground. The insect hung on the underside of the twig and curved the tip of the abdomen (Plate A, fig. 1), emitting a whitish, waxy-looking colleterial fluid and moving the

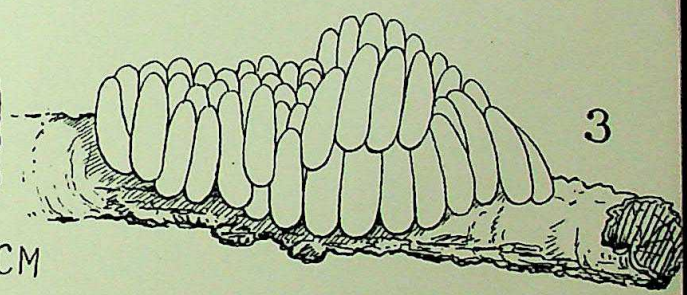
* The fly is perhaps undescribed; it is not yet in the collection of the British Museum, to which, however, the specimens alluded to in this paper will be presented. The male has a conspicuous white tuft on the dorsum just before the genitalia; the legs are black, except the yellow tibiæ. This character distinguishes the species from *P. yessonicus*. Though this is a most ordinary looking *Asilid* and appears to be very common, there is nothing very near to it in the British Museum collection.—D. SHARP.

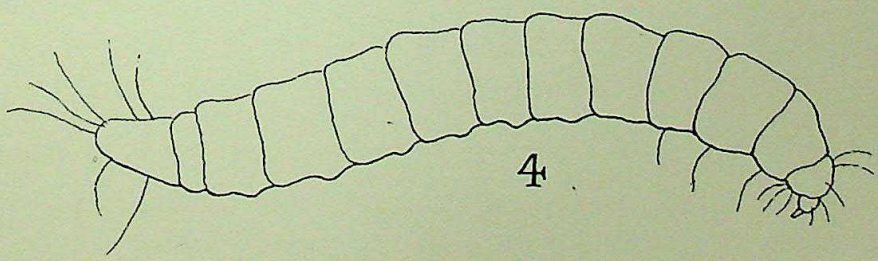
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri









THE OOTHECA OF AN ASILID
(much enlarged).

FIG. 1.—♀ constructing ootheca, which is nearly finished.

FIG. 2.—Transverse section of ootheca. **CM** = colleterial matter, forming outer covering. **T** = twig on which ootheca is built.

FIG. 3.—Side view of eggs, the outer covering having been mostly dissolved away with benzine.

FIG. 4.—Larva just hatched.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

abdomen-tip round and round the circumference of the ootheca now and then stopping this movement to prod over the surface except around the edge—when it was probably ovipositing, but the abdomen-tip, as in the case of a *Mantis* forming its ootheca, was concealed by the colleterial matter. In plan the ootheca is roughly a pointed oval, in transverse section roughly circular, and the pointed end is the part of the ootheca first formed; the large end, which is more or less flat, is finished off by the insect working the abdomen-tip around the ootheca from the circumference gradually to the centre, where the colleterial matter is broken off, leaving a small knob or protuberance. About an hour after its construction, the egg-case is firm on the exterior and, although more or less moulded and wrinkled where the eggs happen to be near the surface, is smooth and of a waxy-white with a slight gloss. The egg-case occupied the insect about an hour in the making, and it then flew away. The ootheca of this species varies much in size according to the number of eggs contained: this particular example was three-eighths of an inch long and three-sixteenths broad and deep at its greatest girth and depth. The eggs are usually laid in two tiers, but with fewer in the upper tier (*lower* tier in the natural position of the ootheca), as shown in Plate A, Figs. 1, 2 and 3. They are slightly cemented together and to the twig by the natural secretion of the ovaries. Outside the eggs, and covering them entirely, is the thick wall of colleterial matter (Fig. 2, C.M.); the eggs are excluded whilst a supply of colleterial matter is kept up over the exterior eggs, so that they are not visible whilst being deposited. They are laid in rather an irregular manner, as may be seen in Fig. 3, where the outer covering has been partly dissolved away with benzine, exposing the eggs. The outer covering is not hard and horny chitinous matter like the egg-cases of some species of *Mantis*, but is moderately firm and microscopically porous, owing to included air-bubbles, somewhat like the spongy outer wall of some of the less specialised *Mantis* oothecæ. These *Asilid* egg-cases, however, often resist the weather for several months after the larvæ have hatched out.

The colleterial glands of the ♀ are two long colourless tubes,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

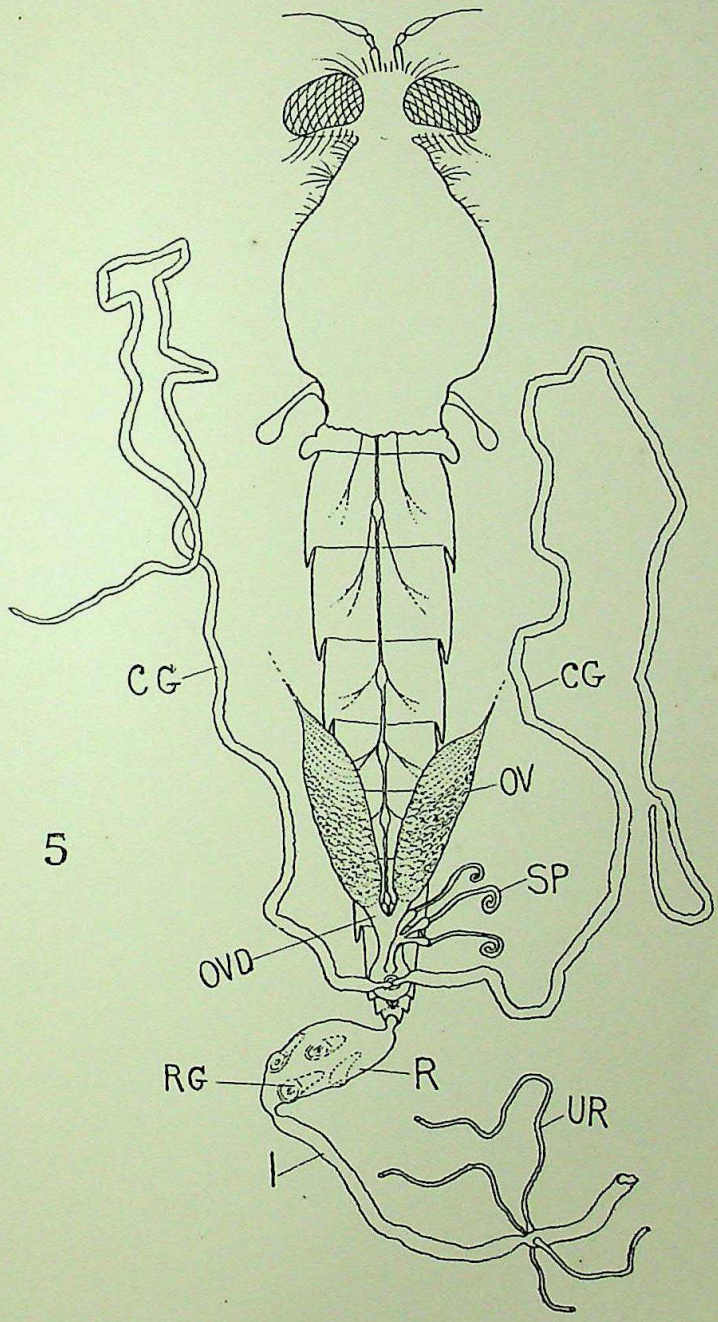
Digitized by Arya Samaj Foundation Chennai and eGangotri

about four times the length of the abdomen, of very even diameter except just at the distal ends, where they taper and end blindly. They open separately but close together into the dorsal wall of the vagina, just behind the spermatheca. The glands pass upwards over the oviducts and forwards to the anterior segments of the abdomen, coiled up and lying on each side of the intestines. When the insect is about to oviposit the glands are of a pale yellow. The ovaries (ov, Fig. 5) shown in the figure are small, the eggs in this specimen not being matured. In their natural position the three curved ends of the spermatheca (SP) are bunched up together. The distal ends are purplish or reddish. There are four rectal glands (RG) like the finger-tips of a glove, which project into the interior of the rectum (R), the tips pointing towards the anus. Tracheal branches from the stigmata are attached to the bases of the glands, and capillaries penetrate to the tips thereof. These tracheæ partly serve to retain the rectum in position. There are four long urinary tubes (UR). The colleterial matter taken from the glands of a freshly-killed fly ready to oviposit, is pale yellow and viscid. Spread on a slip it dissolves entirely in 10 per cent. potash; on the potash evaporating the matter is re-deposited as a semi-opaque film, which easily disintegrates. The fresh material spread on a slip soon dries as a pale yellow translucent film, hard and brittle. After exposure to the air, it is much less easily soluble in potash. Probably the whitish appearance of the completed ootheca and its greater resistance to solvents is due to its aërated or porous condition, since the action of the atmosphere certainly causes some chemical change in the colleterial matter.

The eggs are smooth, whitish and shiny; the number in the ootheca was not counted, but it was certainly over fifty. They hatch in six or seven days, and most of the larvæ emerge simultaneously in a regular rush, though stragglers keep on emerging for two or three hours. They immediately drop to the ground and commence burrowing into it, or descend by the numerous crannies and fissures. The newly-hatched larva (Fig. 4) is smooth, whitish and shiny, with a few hairs on the anterior and posterior segments. I was unable to rear the larvæ, but they probably feed on subterranean coleopterous larvæ.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



THE OOTHECA OF AN ASILID
(*much enlarged*)

FIG. 5.—Abdomen of ♀ opened dorsally, showing colleterial glands, &c. CG = colleterial glands. OV = ovaries. OVD = oviducts. SP = spermatheca. UR = urinary tubes. R = rectum. RG = rectal glands. I = ileum.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

EXPLANATION OF FIGURES.

Fig. 1

♀ constructing ootheca, which is nearly finished.

Fig. 2.

Transverse section of ootheca. CM = colleterial matter, forming outer covering. T = twig on which ootheca is built.

Fig. 3.

Side view of eggs, the outer covering having been mostly dissolved away with benzine.

Fig. 4.

Larva just hatched.

Fig. 5

Abdomen of ♀ opened dorsally, showing colleterial glands, etc. CG = colleterial glands. OV = ovaries. OVD = oviducts. SP = spermatheca. UR = urinary tubes. R = rectum. RG = rectal glands. I = ileum.

All the figures are much enlarged.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

RAMBLING NOTES ON NATURAL HISTORY IN CHITRAL.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

During my year's residence in Chitral I had considerable leisure to devote to natural history objects. In the main my attention was devoted to butterflies, but in their pursuit I had opportunities of observing many other objects, and the following excerpts from my note books may be of interest to others who may be garrisoned there in years to come.

MAMMALIA.

JACKAL (*Canis aureus*), Linnè.—I was asked by Mr. Kinnear to try and get specimens of this among other Mammals, but when I came to question the officers who went out after big game, I found no single one had ever heard it. Mr. Keppel made enquiries for me among the Chitralis, and was told that jackals are known in the Valley in which Arandu is situated, but do not come up as far north as Mirkani. It would seem then that they only just enter the south of Chitral Territory, and it is probable the Lowarai Pass is their proximate Northern barrier.

WHITEHEAD'S STOAT (*Mustela whiteheadi**), Wroughton.—Under the misnomer *Patorius erminea* I referred in a previous Journal (Vol. XX, p. 514) to a specimen of this little known animal killed in Chitral.

COMMON OTTER (*Lutra valgaris*), Erxleben.—Our British Otter is not uncommon. I saw the skins of 3 or 4 specimens, one quite freshly stuffed in the usual Chitrali method with grass. Its grizzled coat, and the angular posterior edge of the rhinorium I presume leave no doubt in diagnosis.

THE SMALLER KASHMIR FLYING-SQUIRREL (*Sciuropterus fimbriatus*), Gray.—Three or four skins of this flying squirrel were brought to me. The Chitralis said they were not uncommon and lived chiefly in walnut and apricot trees. They also said that they nest in holes in trees. They call it "jungli khalao," or "wild rat."

BLACK RAT (*Mus rattus*), Linnè.—The common rat in Chitral in and about buildings is this species.

PERSIAN HOUSE-MOUSE (*Mus bactrianus*), Blyth.—The Persian mouse is the species inhabiting the Fort at Drosh. I caught several, but no other species.

---

* Described in this Journal, Vol. XVIII, p. 882.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

AFGHAN HARE (*Lepus tibetanus*), Waterhouse.—Hares were not very plentiful, but a few came to bag on our day's out chikor shooting. The species is the Afghan hare.

OORIAL (*Ovis vignei*), Blyth.—The Oorial is common. The best heads entered in the game book in the Drosh Mess are as follows :—

Year.	Length.	Sportsman.
1900-01	30″	Major Leslie, R.E.
,,	32″	Lieut. Rice.
1902-03	31″	,, Money.
1905-06	30¼″	,, Robertson-Glasgow.
,,	32½″	Captain Knollys.

HIMALAYAN IBEX (*Capra sibirica*), Meyer.—The following are the best heads that Chitral has furnished of the Ibex :—

Year.	Length.	Sportsman.
1903-04	46¾″	Major the Hon'ble Bruce.
1907-08	46¾″	Captain Nicolay.
,,	45″	Picked up.
1909-10	47¼″	Lieut. A. G. Stone.
,,	45½″	,, A. G. Stone.
,,	45½″	,, E. T. W. McCausland.
,,	47″	Captain Keppel.
,,	45½″	,, E. T. W. McCausland.
,,	47″	,, Keppel.
,,	47″	,, Keppel.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MARKHOR (*Capra falconeri*), Hügel.—The best heads entered in the game book are as follows:—

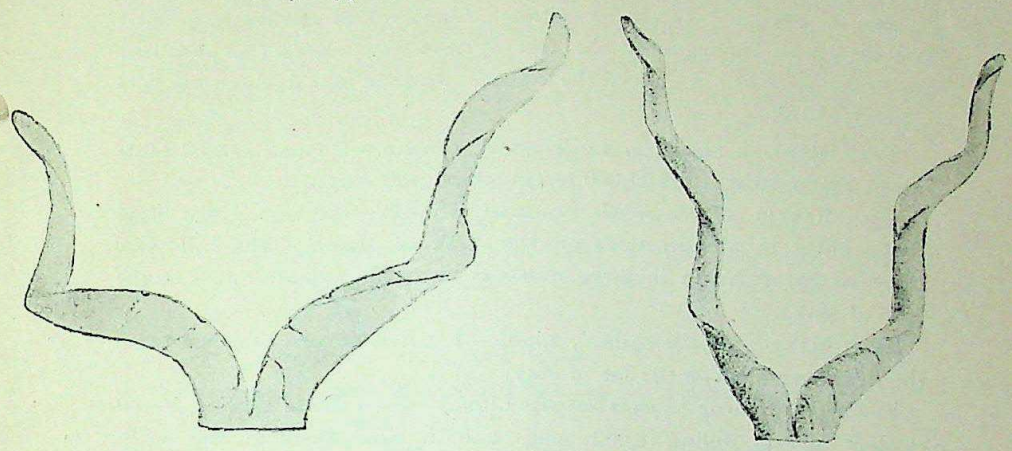
Year.	Length.	Sportsman.
1898-99	56″	Captain Rose.
1899-00	50½″	,, Cooper.
,,	52¾″	,, Gurdon.
1900-01	51″	Lieut. Rice.
,,	57½″	Picked up.
1901-02	51¼″	Major Leslie.
,,	50¼″	Captain Bradly.
,,	55¾″	Picked up.
1902-03	50″	Captain Kennion.
1904-05	50¼″	Lieut. Young.
1906-07	52″	,, Burton.
,,	51¾″	,, Carruthers.
1907-08	51″	,, Toppin.
,,	50″	Captain Nicolay.
1909-10	50″	Lieut. Pemberton.
,,	52½″	Captain Lyall.

The usual variety of horn is the Pir Panjal. The head secured by Captain Rose in 1898 (Figure B) seems to me as near to the Cabul variety as the Pir Panjal. More than one head (as seen by photographs) has been shot with the horns very dissimilar. Figure A shows one shot by Lieut.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Rice in 1900-01, in which the right horn is of the Astor type while the left is of the Pir Panjal type.



A. *B.*

Capra falconeri.

AVES.

In Volume XIX, p. 901, of this Journal, Captain Perreau gave a list with notes of the birds of Chitral. I am able to add a few species to this list which I have marked with an asterisk.

THE GREENISH WILLOW-WARBLER* (*Acanthopneuste viridanus*), Blyth.—I found this among the bag made by two urchins with stonebows. The measurements were: Length 4·5″, wing 2·3″, tail 1·6″, gape ·48″ and tarsus ·75″.

CENTRAL-ASIAN STARLING (*Sturnus porphyronotus*), Sharpe.—Captain Perreau was in doubt as to the species of starling he saw in Drosh. I saw many flights in early November, and on the 5th shot two which I identified as this species, and a skin sent to our Society was acknowledged as such. I saw flights of starlings again late in February flying North, but halting in Drosh.

PARADISE FLYCATCHER (*Terpsiphone paradisi*), Linnè.—I saw a single specimen in black and white plumage in Drosh on the 24th April.

COMMON PIED BUSH-CHAT (*Pratincola caprata*), Linnè.—I noted this common in April on the farm in Lower Drosh.

THE INDIAN BUSH-CHAT (*Pratincola maura*), Pallas.—I saw a few pairs on the farm in Lower Drosh in March.

REDWINGS (**Turdus iliacus*), Linnè.—Captain Perreau says he is nearly sure he saw this bird near Drosh in February. I saw many on the farm at Drosh in February and March and shot one on the 23rd of March to make the point certain.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BROWN DIPPER (*Cinclus asiaticus*), Swains.—Captain Lyall told me he found a nest of the dipper on the 2nd of February in Kesu Nullah.

HOUSE SPARROW (*Passer domesticus*), Linnè.—This species forsook us for the winter, leaving only the tree sparrow (*P. montana*) as abundant as in the summer. I noticed the common sparrow back again in the Fort in early April.

PINE BUNTING (*Emberiza leucocephala*), Gmelin.—I found several nests about Madaglasht (10 to 11,000 feet) in June and July.

CRAG-MARTIN (*Ptyonoprogne rupestris*), Scopoli.—The first I saw were flying about in all directions on the 27th of March. The last were observed flying North in large numbers even till well after dusk on the 16th of May.

SAND-MARTIN (*Cotile riparia*), Linnè.—I noted several hawking about the river near Kesu on the 1st of May.

EUROPEAN HOOPOE (*Upupa epops*), Linnè.—I saw these species in the summer up to fully 12,000 feet, and it was breeding well up to 11,000 feet.

CUCKOO (*Cuculus canorus*), Linnè.—I heard the cuckoo first on the 8th of May. I chased a company of at least six on my pony all flying south on the evening of the 16th of May. Each separately fluttered out of the wayside trees and hedgerows, to perch a hundred yards or so further on, and repeat the flight as I passed by.

HIMALAYAN GRIFFON (**Gyps himalayensis* ?), Hume.—A large vulture is fairly common in Chitral which I suspect is the above species. It is in flight just like a large edition of the next species, but is much too large to have been confused with that species. I saw it in the winter about Drosh always flying very high. In the summer above Madaglasht I saw them many times, and on more than one occasion congregated on the carcasses of goats, etc.

EGYPTIAN VULTURE (*Neophron percnopterus*), Linnè.—Captain Perreau mentions this in the summer, but I saw it not infrequently in the winter.

MERLIN (**Æsalon regulus*), Pallas.—Among the Mehtar's hawks I saw a specimen of this hawk in very fine plumage. The attendant informed me it had been reared in the country.

LARGE EGRET (**Herodias alba*), Linnè.—Captain Lyall sent me a skin. He bagged one of three seen on the 1st of May.

GREY LAG GOOSE (**Anser ferus*), Schœff.—I do not think I could have been mistaken in the identification of this goose, though none was brought to bag. Geese were frequently heard at night flighting by, and I several times saw flocks that I took to be this species. In Malakand years ago at about the same time of year I remember more than one being shot.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BRAHMINY DUCK (**Casarca rutila*), Pallas.—I saw three Brahminy duck flying north on the 17th April, and a large flight containing over 70 on the 25th. I saw one or two settled on the banks of the river at Drosh.

GADWALL (**Chaulelasmus streperus*), Linnè.—A few shot in March.

RED-CRESTED POCHARD (**Netta rufina*), Pallas.—Many seen, and a few shot in March.

POCHARD (**Nyroca ferina*), Linnè.—I shot one on the 27th March.

WHITE-EYED DUCK (* *Nyroca ferruginea*), Sharpe and Dresser.—A few shot in February and March going north.

SMEW (* *Mergus albellus*), Linnè.—A party of four were seen after the very severe snowstorm in January. Three of these were brought to bag on the 29th of January.

REPTILIA.

The reptiles of Chitral formed the subject of a separate paper which has already appeared in this Journal.*

PISCES.

Oreinus richardsoni.—I sent home specimens of the fish called by every one "Snow trout" to Mr. Boulenger. It appears that these are not trout at all but a species of a different genus.

ANNELIDA.

Gordius zorattarii (Camerano).—On the 28th of March in very cold weather a specimen of this wire worm was found in the mule trough in Lower Drosh. The Chitralis firmly believe that it falls with the rain. I heard of others being found in the snow about the time when rain was falling. I sent this to Professor Camerano at Turin who identified it, and told me little or nothing is known of its habits. The type was found near Darjeeling. I have had specimens sent me from Shillong in the Khasi Hills, Assam, from Dibrugarh in Upper Assam, and found a specimen myself this year in my compound at Almora on the 2nd of January on a very cold day whilst sleet was falling. This last, the largest I have seen, measured 19½ inches, and was the calibre of a fiddle string.

LEPIDOPTERA.

Papers have already appeared in our Journal on the butterflies of Chitral contributed by Captain W. H. Evans, R. E.†

To the species referred to in these papers I can add three, the identification of which has been confirmed by Captain W. H. Evans.

Argynnis pales.—I found this fairly common at about 13,000 feet on slopes above Madaglasht, at the end of July and beginning of August, in company with *A. jerdoni* var. *chitralensis*. On the last day of July on the Doki Pass at about 14,000 feet where species were very limited, I

* Vol. XXI, page 132. † Vol. XIV, p. 666 and Vol. XX, p. 423.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

came across this in great numbers on a steep stony shale slope. I captured about sixty in a couple of hours, on an otherwise uneventful day.

Lycaena jaloka.—This species was very abundant on a small patch of stony ground in July above Madaglasht at about 12,000 feet. The females were less numerous than the males. It was extremely local and confined to about an acre, and I never saw another specimen, except a solitary one at the foot of the Doki Pass at about the same altitude on the 31st July.

Pieris kreuperi, race *desta.*—Of this species I obtained but half a dozen specimens in June in the Lutkoh valley at about 6,000 feet elevation.

PSYCHODIDÆ.

Phlebotomus pappatasii and *P. babu.*—I collected sand-flies in the Fort at Drosh, and submitted them to Dr. Annandale for identification. Two species were found prevalent, and one or both are believed to be the transmitting agents of that disagreeable fever so common in Chitral which is variously known as Drosh fever, Chitral fever, Sand-fly fever, phlebotomus fever, pappateci fever, etc., etc. They haunt the dark corners of rooms, getting behind shutters and doors, and bite freely at night.

CULICIDÆ.

Two collections of mosquitoes made by me unfortunately come to grief in the post, so it remains for another to trace the species on which we are dependent for malarial fevers in the Chitral Garrison.

FILICES.

Ferns were extremely poorly represented in species. At the level of Drosh, up to about 6,000 feet I only saw three species, though I frequently went in search of them. About Madaglasht during my excursions after butterflies I frequently went out of my way to investigate the ferns, but I do not think I ever saw more than three species.

Cystopheris fragilis (Berah).—A fern which I took to be the bladder fern was quite common about Madaglasht (10,000 feet and over).

Cheilanthes szoritzii (Fisch and Meyer).—A species of Cheilanthes was very common about Drosh which I think I am not mistaken in referring to this species.

Adiantum cappillus veneris (Linnè).—This was common everywhere, where damp enough, at low elevations.

Hemidictyum ceterach (Linnè).—The Scale fern flourishes, and is abundant about Drosh at elevations up to at least 6,000 feet.

Asplenium trichomanes (Linnè).—I found this plentiful all about Madaglasht.

Asplenium septentrionale (Linnè).—The forked Spleenwort grows abundantly in the vicinity of Madaglasht.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SOME BIRDS AND BIRDS' NESTS FROM HAKA, CHIN HILLS.

BY

CAPTAIN F. E. W. VENNING.

The following short list of such birds and birds' nests as I was lucky enough to find at Haka is forwarded with the hope that it may encourage some one else to observe the very abundant bird life in that happy spot from which, to my regret, I have now been transferred. Most of the skins obtained were sent to Major H. H. Harington who took them home with him and identified them for me and my thanks are due to him for his valuable advice and encouragement to my first efforts in ornithology, and for his remarks on these notes which I have interpolated in the places where they apply, putting them in square brackets followed by the initials H. H. H.

The numerals and nomenclature are those of the "Fauna of British India."

CORVIDÆ.

CORVINÆ.

(4) THE JUNGLE CROW, *Corvus macrorhynchus*.—Called by the Chins "Ak" (like the English word "Ark") or more particularly "Klang (mountain) Ak," the monosyllable being a very good representation of the bird's call. Very common, but I found no nests. The elytra and other hard parts of dung beetles were found in the stomach of one.

(12) THE RED-BILLED BLUE MAGPIE, *Urocissa occipitalis*.—Plentiful, generally to be seen going about in families of six or eight which always attract attention by their harsh scolding. One brought alive by a Chin. No nests found. Perhaps *U. flavirostris* also occurs.

[Recorded by Col. Rippon from Mt. Victoria. There is also a skin of his from the same locality of *U. flavirostris*.—H. H. H.]

PARINÆ.

(34) GREEN-BACKED TIT, *Parus monticola*.—Very common. Two

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nests of this species were found by me. The first was found on the 3rd May 1910 and was placed in a small hole just below the branch of a wild pear tree (*Pyrus pashia*). The hole was about six inches long running horizontally into the tree-trunk. The nest consisted of a thick pad of moss interwoven with fine hairs and wool. The eggs were five in number measuring from ·66 × ·52 to ·64 × ·51, and were pale pink with some pale brownish red blotches scattered round the larger end chiefly. The second nest was found on 7th May and brought in by a Chin, who brought the bird with it, and said he found it in a hole in the ground. The nest was composed of moss and hair (? goat's). There were five eggs, rather paler than the last with the spots more generally scattered over the whole surface. These measured from ·68 × ·54 to ·66 × ·53. In the former case the eggs were in an advanced state of incubation.

[Also got by Col. Rippon at Mt. Victoria. Very interesting how many of the Himalayan and Indian birds turn up in the Chin Hills and Aracan.—H. H. H.]

(36) HUME'S RED-HEADED TIT, *Aegithaliscus manipurensis*.—Fairly common, but in spite of days of careful watching I never found the nest. The tarsus measured ·65 in., not ·35 as given in the "Fauna."

[Recorded by Col. Rippon from Mt. Victoria.—H. H. H.]

CRATEROPODIDÆ.

CRATEROPODINÆ.

Babax victorie (Rippon).—One nest found by my wife on 13th April. The nest was an open cup composed of dead leaves and thick grass stems lined with fine root fibres placed about two feet above the ground between the stems of a small thorny bush at the head of a little swamp. The interior diameter of the nest was 3½ inches with a depth of 1½ to 2 inches. When found there was only one egg but a second was laid on 14th, after which the bird was continually on the nest till the 18th when the bird was shot and the nest taken. Eggs opaque turquoise blue 1·2 × ·86 and 1·19 × ·83. The bird was very difficult to see after it had once left its nest, and skulked in the thickest bushes.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

[Discovered by Col. Rippon at Mt. Victoria. Description in the B. B. O. C., Vol. XV, p. 97. This is a much larger bird than *B. yunnanensis* from Bhamo. This is the first record of its nest and eggs.

N. B.—*Babax lanceolatus* was reported in the J. A. S. B., Vol. LXXI, part II, no. III/02 by Lieut. H. Wood, R. E., and F. Finn as having been got in the Chin Hills. This must be a mistake and the bird wrongly identified and it would be advisable for the Calcutta Museum to have the skin properly identified. It gives a wrong locality for *B. lanceolatus* which so far has not been recorded I believe from Indian limits—although I believe it is the same bird as *B. yunnanensis* the only difference being the cheek stripe which in one is dark chestnut, in the other black.—H. H. H.]

(83A) *Trochalopterum holerythrops* (Rippon).—Two specimens shot on 23rd July 1910 and a few others seen. Has a very pretty mellow whistle.

(98) MANIPUR STREAKED LAUGHING-THRUSH, *Trochalopterum virgatum*.—Three nests found. In each case the nest was situated low down in a clump of thatching grass and was a large loosely built cup-shaped structure of dried grasses with a leaf or two worked in and lined with some loosely laid-in grass roots and feathery grass tails. The measurements were roughly 2½ inches deep by 3 to 3½ inches diameter internally. One bird was netted on its nest on 17th April, one was shot as it left its nest on 22nd April, and the third was allowed to go as its nest was found to contain a young bird and an addled egg on 30th April. The eggs were pure greeny blue, the colour one often sees in poor specimens of turquoise, and varied between 1·15 × ·8 and ·98 × ·76 and in each case there were two in the nest.

[Also procured by Col. Rippon at Mt. Victoria. Nest and eggs described in B. N. H. S. Journal, Vol. VIII.—H. H. H.]

(125) RUFOUS-NECKED SCIMITAR BABBLER, *Pomatorhinus ruficollis*.—One nest brought in by a Chin on 1st May with the bird noosed on the nest. It was said to have been found on the ground under a bramble and was composed of coarse grass stems and pine needles with an outer layer of dry bamboo sheath or some similar substance forming a thin walled cup partially domed over,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

about 4 to 5 inches long by 3 to 3½ inches in height. Eggs three, plain white somewhat pointed, ·94 × ·69 to ·88 × ·68. Bird not uncommon.

[Procured by Col. Rippon.—H. H. H.]

(130). McClelland's Scimitar Babbler, *Pomatorhinus macclellandi*.—Three nests of this species were obtained. One was brought with the bird by a Chin on 19th April, and contained three eggs all well incubated. The other two were found by me, one on 13th and one on 18th April; the latter contained two young birds and an addled egg which I took; the former had only one egg in it when found, but three when taken on 18th. At that time the bird had been sitting very steadily for a day or two, bustling away half running, half flying, into the bushes when I approached. I netted one bird on the evening of the 17th and the mate was on the nest on the following day, but after very heavy rain on the evening of 18th I found the nest much broken in and apparently deserted and took the eggs. In both cases found by me the nest was situated on sloping ground under some bramble sprays and well hidden among dead canna leaves and woody herbs. It was a loosely constructed dome-shaped nest composed almost entirely of grass. Internal dimensions back to front 4 inches, bottom to dome 3 inches. Eggs measured from 1·05 × ·78 to ·95 × ·75 and one was only ·73 in diameter.

[First record from Burma.—H. H. H.]

Brachypteryginæ.

(191) Indian Blue Chat, *Larvivora brunnea*.—Bird quite common. One flew against the window pane and stunned itself one morning while we were having "chhota hazri."

Two nests were found of this species; in both cases the eggs were pure turquoise blue. The nest, placed on the ground in a bank, was a cup of dry pine needles lined with black hairs and a few leaves in one case and in the other was composed of grass stems lined with hair and feathers. The eggs were three in each case and well incubated, one being obtained on 16th May and the other on 26th June and their measurements were from ·78 × ·57 to ·75 × ·55.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

[Found nesting at Mt. Victoria by K. C. Macdonal.—H. H. H.]

(211A) RIPPON'S BAR-WING, *Actinodura ripponi* (O. Grant.)—One of a pair was shot by me on a tree on the outskirts of the jungle on 29th April.

[Described in Ibis, January 1907, p. 186. Found nesting by me at Sinlum, Bhamo.—H. H. H.]

BRACHYPODINÆ.

(279) BURMESE RED-VENTED BULBUL, *Molpastes burmanicus*.—A very common bird of which I took several nests in 1909 but only found one with eggs in 1910. There were three eggs.

(292) FINCH-BILLED BULBUL, *Spizixus canifrons*.—Also very common, several nests with hatchlings found in 1910.

SITTIDÆ.

(318) AUSTEN'S NUTHATCH, *Sitta nagaensis*.—Quite common, but no nests procured. Undoubtedly breeds at Haka, as many young fledglings were seen and one shot. One adult when shot remained hanging to the branch it was on, head downwards, until I got up and detached it when I found to my surprise that it was quite dead.

[Taken by Col. Rippon. Found nesting at Sinlum, Bhamo, by me. A bird found in the hills both on the East and West of Burma. Only got above about 5,000 feet, below this its place is taken by *S. neglecta*—H.H.H.]

CERTHIIDÆ.

(355B). *Urocichla oatesi* (Rippon).—One nest obtained on 30th April 1910 on a sloping bank of dried grass beneath some trees. The bird was shot as it left its nest. The nest was a large oval-shaped, domed structure composed of an outer layer of dead leaves, canna leaves, coarse grass, etc., inside which was a layer of grass stems, fibres and a little moss, the cup being lined up to the level of the entrance with a plaster about 1-16th inch thick composed as far as I could determine of a substance which looked like chewed thistle stem or chewed grass. The bottom of the nest when taken was found to be quite moist from contact with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the damp ground.* The dimensions of the whole were exterior height 6 in., diameter back to front 5 in., side to side 4 inches. Entrance near the top about 2 inches across by 1½ inches high. Interior diameter 2 inches each way, depth of cup inside from lower edge of entrance about one inch. Eggs three in number measured ·73 by ·6, ·72 by ·6 and ·69 by ·59, and were dull white sparingly freckled with reddish and faint purple.

[B. B. O. C., Vol. XIV, p. 83. Discovered by Col. Rippon at Mt. Victoria. Yours is the first record of its nesting.—H. H. H.]

SYLVIIDÆ.

(372) BROWN BUSH-WARBLER, *Tribura luteiventris*.—One nest found and bird netted on it on 27th April 1910. The nest was a large loosely-built ball of grass blades and leaves lined with fine grass-tails with a small opening on one side near the top. It was placed nearly on the ground supported between some stiff grass stems and herbs and overhung by thistles, bracken and grasses which concealed it so well that, even when I knew within a few inches where it was, I found considerable difficulty in locating it. The eggs were three, whitish spotted with reddish brown more thickly near the larger end. Measurements ·73 × ·56. Another nest which I am pretty sure belonged to the same species was obtained within a few days but the bird escaped out of my hand after being netted.

[Recorded by Col. Rippon from Mt. Victoria.—H. H. H.]

(420) TENASSERIM WHITE-TAILED WILLOW-WARBLER, *Acanthopneuste davisoni*.—One nest was brought in with the bird which had been noosed by a Chin. He stated he had found the nest

---

* *Note.*—Apropos of this nest, Major Harington informs me that when at Sinlum, Bhamo, in 1905, a similar nest and eggs were brought to him by a Kachin.

He accompanied the Kachin to the spot whence the nest was obtained, but saw no bird. In 1908 when he was up there again he hunted the same bit of jungle but never saw another nest. He did, however, shoot a specimen of *U. sinlumensis* there, so that in all probability the eggs he found in 1905 belonged to that bird.

Major Harington's nest was found in a very damp shady spot, very much like the situation of my nest, and his description of the lining of his nest as "a papier mache sort of cup" is a better description of the appearance of my nest than I have given. It is doubtless a provision to keep the inside of the nest dry.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on the ground in short grass. The nest was a little soft cup composed as follows: an outer layer of fibres and some grasses, inside which was a thickish layer of moss with a patch of black horsehair on one side, the whole being lined with a plentiful supply of soft black hairs intermingled with a few white ones. The internal diameter was less than two inches and depth about one inch. Eggs 4, pure white, measuring from ·61 × ·45 to ·59 × ·44. The same man brought in another nest three days later, on 28th April, which was exactly the same and also contained four eggs varying from ·6 × ·46 to ·58 × ·46, but as he had failed to noose the bird I could not be certain it was the same species.

[The nest must have been domed and the inside only brought you. I found it nesting on the Bhamo Hills and Oates on the Byingyi Hills.— H. H. H.]

(432) ANDERSON'S FLYCATCHER-WARBLER, *Cryptolopha tephrocephala.*—Nest taken and bird netted on nest by me on 21st May 1910. Nest was found on the ground near the top of a small bank about eighteen inches high and was well concealed by an overhanging tuft of grass and some herbaceous leaves. It was a largish oval-shaped, domed structure composed outside of coarse grasses loosely laid together, the entrance being on one side and well overhung. Inside, it was lined with very soft moss and thistle down, the moss well separated before being made into a compact cushion. The dimensions were outside height 6 inches, back to front 4½ inches, side to side 4 inches. Diameter of entrance about one inch. Interior diameter about 1½ inches, depth of cup from edge of entrance one inch. Eggs 4, pure white, measuring ·61 × ·46, ·59 × ·46, ·58 × ·46 and ·58 × ·46.

[Found by me nesting at Sinlum. My eggs slightly bigger than yours.—H. H. H.]

(460) AUSTEN'S HILL-WARBLER, *Suya khasiana.*—Very common. Several nests found, the most striking thing about which was the dainty roofing of moss always to be found worked into the grass of the dome, whether for concealment or for protection from rain I cannot say. The earliest nest was found on the 30th April and the latest with fresh eggs on the 20th June 1910. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

eggs varied very considerably in size and in colour, the largest being ·7 × ·52, and the smallest ·6 × ·46. The latter was exceptional, the average size being about ·67 × ·49. The ground colour was sometimes distinctly greenish, sometimes white with no tinge of green and the amount of sprinkling also varied very considerably. These variations were so great that I am still in doubt whether some of my nests are not those of another species.

[Found breeding at Mt. Victoria by P. F. Wickham.—H. H. H.]

LANIIDÆ.

(495) SHORT-BILLED MINIVET, *Pericrocotus brevirostris*.—Quite common, but I only discovered one nest and that had young in it on 20th April. It was the most exquisite nest I have seen and I took a photograph of it which I am forwarding to the Society.

MUSCICAPIDÆ.

(579) VERDITER FLYCATCHER, *Stoparola melanops*.—One nest with four eggs was found in the wall of 800 yards firing point on the rifle range close to thick jungle on 1st May 1910. The stomach of the bird was full of remains of "lady-birds."

[Recorded by Rippon.—H. H. H.]

(594) RUFOUS-BELLIED NILTAVA, *Niltava sundara*.—One nest was found under a stone on 28th April and had three eggs. Another was found with two eggs in it on 11th August 1910, in a hollow in a cutting.

[Recorded by Rippon.—H. H. H.]

(603) YELLOW-BELLIED FLYCATCHER, *Chelidorhynx hypoxanthum*.—One specimen shot in thick jungle but not uncommon, I think, though no nests were found.

[Recorded by Col. Rippon.—H. H. H.]

(605) WHITE-THROATED FANTAIL FLYCATCHER, *Rhipidura albicollis*.—One nest with three eggs taken by me on 18th May and the nest photographed. The bird very common and once or twice seen flirting about on the ground. The eggs measured between ·70 × ·54 and ·67 × ·51.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

TURDIDÆ.

SAXICOLINÆ.

(615) DARK-GREY BUSH-CHAT, *Oreicola ferrea.*—Very common. Eleven clutches of eggs and nests were taken, the earliest on 13th April and the latest on 28th April. The usual number of eggs in a clutch was four but two clutches of five were found. Out of the eleven clutches, found six consisted of pure (pale turquoise) blue eggs, without spots or markings of any sort. The others consisted of eggs similarly coloured but with a faint circle of brownish spots near the larger end, sometimes so faint as to be almost unnoticeable unless closely examined. One clutch taken on 21st April was remarkable in having one egg on which no markings were discoverable, one egg with just a faint smudge of brown near the larger end and the other three marked in the normal way.

[On two or three occasions (see B. N. H. Journals) I have pointed out the difference in the Burmese and Chinese eggs from the Indian which are pale greenish profusely spotted with rusty red; and when at home I told Hartert about it, and I see in his book he has found that the birds are different and has called the Burma bird after me. Here is the description :—

"Die Vögel der Paläarktischen Fauna," p. 711, by Dr. E. Hartert. 1080 *Oreicola ferrea haringtoni*, Subsp. nov. Cat., eggs British Museum, Vol. IV, plate VII, fig. 18.

(Translation) "Distinguished from *O. ferrea ferrea* by the constantly shorter tail. Tail 57-61, 61·5 mm. Wing 65-68 mm. Mupin and other parts Szetchuan to Fokeni in S. E. China, also Burma and the Hill tracts S. of the Brahmaputra. Eggs darker blue than *O. ferrea ferrea* and in particular unspotted like those of the hedge-sparrow." This is not quite correct.—H. H. H.]

RUTICILLINÆ.

(638) WHITE-CAPPED REDSTART, *Chimarrhornis leucocephalus.* Was a cheerful visitor, always announcing his arrival with a loud piping whistle but disappearing during the breeding season to slightly lower levels. I do not think he bred at Haka as I never could find any traces of him just during the breeding season unless

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I went down into the valleys when he was easily found, though I never found the nest.

[A winter visitor; breeds in the hills and in China. Not recorded by Col. Rippon from Mt. Victoria, but has been procured in other parts of Burma.—H. H. H.]

TURDINÆ.

(698) SMALL-BILLED MOUNTAIN-THRUSH, *Oreocincla dauma*.—One specimen was shot in 1909. No nests.

[Recorded by Col. Rippon.—H. H. H.]

(704) LARGE BROWN THRUSH, *Zoothera monticola*.—One nest of this species was found on 15th May 1910. The bird was shot as it left its nest on 19th May. The nest was found about 15 feet from the ground in an elm sapling growing by a stream on the border of a strip of thickish jungle. It consisted of a large lump of earth for a basis, intermingled with sticks and fibres and with a little moss worked into the outside, the whole being scantily lined with some whitish roots or fibres. It was 4 inches across the interior and 1½ inches deep giving it a shallow bowl shape inside, but the whole nest was about one foot in diameter. The whole structure was placed in a fork of the tree. The eggs, three in number, were pale bluish green with a dark cap of brownish red over the larger end, the whole with bold spots and smudges of the same colour. Measurements 1·28 × ·84, 1·28 × ·83 and 1·27 × ·87.

[Not recorded from Burma before, and I believe this is the first record of its nesting.—H. H. H.]

FRINGILLIDÆ.

FRINGILLINÆ.

(779) TREE SPARROW, *Passer montanus*.—Common.

MOTACILLIDÆ.

(826) WHITE WAGTAIL, *Motacilla alba*.—A common winter visitor. No nests found.

(847) INDIAN PIPIT, *Anthus rufulus*.—One nest taken on 18th April and the bird netted on the nest. Eggs three, one of which was found on the ground outside the nest when the nest

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

was first discovered and when taken next morning had a small hole in it and some maggots.

ALAUDIDÆ.

Alauda japonica.—One nest and bird brought by my Chin collector on 30th April. The three eggs were all on the point of hatching.

[Recorded as breeding at Mt. Victoria by K. C. Macdonald. Also got there by Col. Rippon.—H. H. H.]

NECTARINIIDÆ.

(887) FIRE-TAILED YELLOW-BACKED SUNBIRD, *Æthopyga ignicauda.*—Very common but no nest found, except an old one which I think may have belonged to this species.

[Recorded by Col. Rippon.—H. H. H.]

CUCULIDÆ.

(1104) THE CUCKOO, *Cuculus canorus.*—One female shot on 30th April laid a soft skinned whitish egg in my hand as it died. The egg measured ·88 × ·6. Another specimen contained a large yellow caterpillar or grub with a bright red head and five longitudinal black lines from head to tail.

(1113) RUFOUS-BELLIED CUCKOO, *Cacomantis merulinus.*—Fairly common. No eggs of either of these cuckoos were found.

ASIONIDÆ.

BUBONINÆ.

(1173) SCOPS OWL, *Scops giu.*—One specimen was shot at midday as it sat on a twig under some brambles. I mistook it at first for a specimen of *Felis chaus.*

COLUMBIDÆ.

TRERONINÆ.

(1283) KOKLA GREEN PIGEON, *Sphenocercus sphenurus.*—Common, but no nest found.

COLUMBINÆ.

(1307) SPOTTED DOVE, *Turtur suratensis.*—One nest taken which I think belonged to this species, but may have been a nest

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of "*tigrinus*." The bird was so common that I forgot to make certain of its identity. Nests were also very common.

[*T. suratensis* not found in Burma, but *tigrinus*.—H. H. H.]

(1312) BAR-TAILED CUCKOO-DOVE, *Macropygia tusalia*.—Bird shot but no nest taken.

GALLINÆ.

PHASIANIDÆ.

(1327) GREY PEACOCK-PHEASANT, *Polyplectrum chinquis*.—One skin obtained by Mr. Street in 1908 on the border between the Haka sub-division and the Lushai Hills was seen by the writer but not carefully identified as he was not at the time aware of the possibility of its belonging to a distinct species.

(1331) MRS. HUME'S PHEASANT, *Phasianus humiæ*.—Not uncommon, as many as ten birds being seen on one occasion in one small clump of grass and dwarf date palm. One specimen had its crop full of acorns.

(1346) GREY-BELLIED HORNED PHEASANT, *Tragopan blythi*.—Often seen near Fort White though none seen by the writer near Haka. Only mentioned in these notes because referred to by Oates as a shy bird, whereas it was so bold when met on the road that a brother officer knocked one over with a stone after having several shots at it.

(1352) WESTERN BAMBOO-PARTRIDGE, *Bambusicola fytchii*.—Very common. Nest found under a clump of grass but all the eggs in it were broken.

(1374) CHINESE FRANCOLIN, *Francolinus chinensis*.—One brought alive by a Chin was kept for some time by the writer but eventually released.

HEMIPODII.

TURNICIDÆ.

(1382) BUSTARD QUAIL, *Turnix pugnax*.—Shot on 27th August 1910.

(1386) BURMESE BUTTON-QUAIL, *Turnix blanfordi*.—Not uncommon.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CHARADRIIDÆ.

SCOLOPACINÆ.

(1482) WOODCOCK, *Scolopax rusticula.*—Quite plentiful in the winter.

(1483) WOOD-SNIPE, *Gallinago nemoricola.*—Two specimens shot in 1909.

(1484) FANTAIL SNIPE, *Gallinago cœlestis.*—Not quite so plentiful as the next.

(1485) PINTAIL SNIPE, *Gallinago stenura.*—A very fair bag of these could be made, but as the feeding grounds were small and far apart it required a good deal of walking.

(1486) HIMALAYAN SOLITARY SNIPE, *Gallinago solitaria.*—Two specimens obtained as already recorded in the Journal.

ANATIDÆ.

ANATINÆ.

(1597) COMMON TEAL, *Nettium crecca.*—Shot on two occasions at Haka.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A NEW SNAKE *PSAMMOPHIS TRITICEUS* FROM BALUCHISTAN.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

In Volume XX of this Journal (p. 1033), I remarked upon the collection of snakes in the Quetta Museum which had been submitted to me for identification.

Under the title *Psammophis schokari* I showed good reason to suppose that I had included two distinct species. This opinion is confirmed by the receipt of two more specimens from the Honorary Secretary, McMahon Museum, Quetta. It does not conform to the description of any other Psammophis in Mr. Boulenger's Catalogue, and I propose to name this new species *triticeus* on account of its wheaten colour.

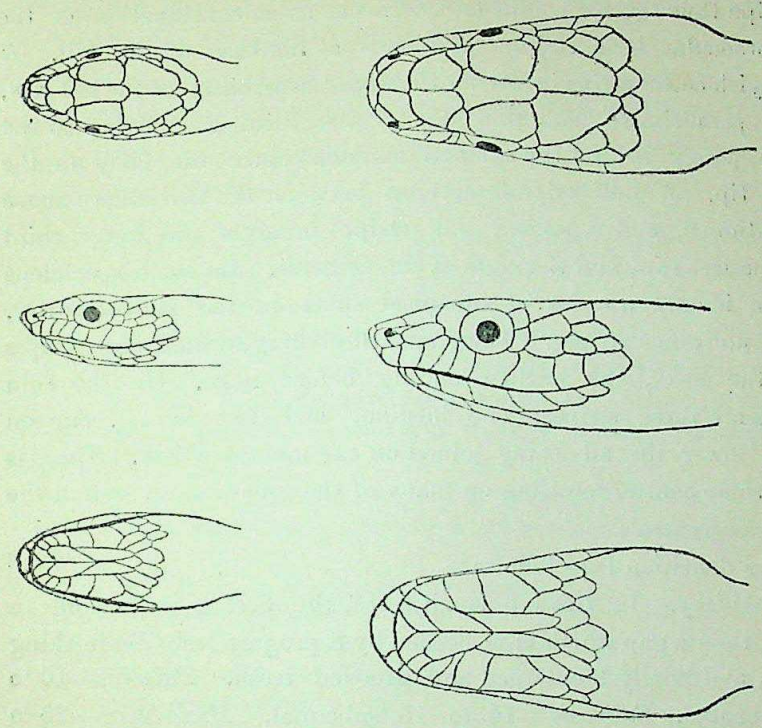
The new species differs from *schokari* in having (1) fewer subcaudals, (2) three supralabials touching the eye, (3) the scales reducing posteriorly to 13 instead of 11, (4) in its markings, (5) probably its size (though on this point I cannot speak positively), and (6) finally and most important, its dentition.

I have now seen six specimens, and have been permitted to retain one from which I have obtained a skull preparation. The lengths of the two specimens now before me are 20¾", and 24½", the tails, respectively, 5" and 5½". My largest *schokari* is 46", the tail 16⅛".

Description.—*Rostral* touches 6 shields, the sutures subequal. *Internasals*—A pair, the suture between them three-fifths, that between the præfrontal fellows, rather less than the internaso-præfrontals. *Præfrontals*—A pair, the suture between them one-third greater than the præfronto-frontal, in contact with internasal, postnasal, loreal, præocular and frontal. *Frontal*—Touches eight shields, the fronto-supraoculars four or five times the length of the fronto-parietals. *Supraoculars*—Length equal to frontal, breadth two-fifths greater than the middle of frontal. *Nasals* divided; the posterior nasal is again divided into two superposed parts, touch the 1st and 2nd labials. *Loreal*—One, elongate, as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Psammophis triticeus juv. (*nat. size*).

Psammophis scholari. (*nat. size*).

long as the nasals. *Praeocular*—One, touching the frontal. *Postoculars*—Two. *Temporals*—Two. *Supralabials*—9, the 4th, 5th and 6th touching the eye. *Infralabials*—6, the 6th largest, and in contact with two scales behind. *Sublinguals*—Two pairs, the posterior longer and in contact with the 5th and 6th infralabials. The snout is one-third longer than the horizontal diameter of the eye. *Costals*—Two headslengths behind head 17, midbody 17, two headslengths before vent 13. In the reduction of rows first the 3rd above the ventrals is absorbed into the row above or below; then the uppermost is absorbed into the vertebral. *Ventrals*—177 to 186. *Anal* divided. *Subcaudals* 75 to 88.

Colour.—Wheaten. A series of small black sub-apical short streaks on the sixth row above the ventrals, on the lower part of the 7th and upper part of the 5th rows. The interrupted formal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stripe thus formed begins on the neck as a continuation of the supraocular head stripes, and ends at the base of the tail. A greyish costal stripe involving the upper two-thirds of the last row, the penultimate, and the edge of the third row begins in the lore, passes behind the eye and extends down the body to the tail tip. A buff stripe intervenes between the two stripes above mentioned, and a second buff stripe involves the lower third of the last row, and the edge of the ventrals. In some specimens there is only a series of subapical spots on the 6th costal row, and no other stripes. There are three longitudinal dark stripes on the head, the median ending before nape. On the chin there are three stripes, one median, and two lateral, one on each lower lip, all being joined on the mental shield. There is also some central mottling on many of the gular scales, and on the anterior ventrals.

The dentition is as follows :—

Maxillary.—In front 5 small teeth, the first 3 increasing in size; then a gap which is succeeded by 8 progressively diminishing teeth, and finally 2 enlarged and grooved teeth. *Palatine*—10 to 11 subequal. *Pterygoid*—14 to 15 subequal. *Mandibular*—25 to 26, the first 4 or 5 increasing in size, after which the succeeding teeth progressively diminish in size.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

[*From the* "Proceedings of the Malacological Society," Vol. IX, Part VI, September, 1911.]

DESCRIPTION OF A NEW SPECIES OF *ACMÆA* FROM BOMBAY, AND NOTES ON OTHER FORMS FROM THAT LOCALITY.

By Edgar A. Smith, I.S.O.

Read 9th June, 1911.

Specimens of an *Acmæa* from Bombay have recently been presented to the British Museum by Major A. J. Peile, R. A., and as the genus has not been until recently[1] recorded as inhabiting the shores of India, it seemed desirable to give an account of the present species. Its existence at Bombay, however, has been known to me since the year 1882, when the late Dr. W. T. Blanford gave to the Museum a dozen examples. These, however, were only about half the size of those received from Major Peile.

The shores of Bombay are not very prolific in limpet-like forms such as *Patella*, *Acmæa*, etc. Messrs. Melvill & Abercrombie[2] enumerate the following:—

1. *Fissurella Bombayana*, Sow. = *lima*, Sow.
2. *Emarginula elongata*, Phil.
3. *E. radiata*, Gould.
4. *Scutum unguis* (Linn.).
5. *Patella aster*, Reeve.
6. *Clypidina notata* (Linn.).

No. 2. *Emarginula elongata*. Philippi never published a species under this name, but he quoted[3] the Mediterranean shell described by Costa with that appellation. This is quite distinct from the shell figured by A. Adams & Sowerby as "*E. elongata*, Philippi."[4]

The specimens from Bombay thus identified have kindly been sent to me for examination by Mr. J. C. Melvill, who borrowed them from the Manchester Museum, where they were placed by Mr. Abercrombie, by whom they were collected. A careful study of them proves that they are neither the *elongata* of Costa nor of the Thesaurus but are certainly identical with *E. dilecta*, A. Ad., orginally said to be from King George's Sound, South Australia. In the Museum there are several specimens collected at Bombay by Mrs. Deakin, by whom they were presented.

The "*E. elongata*, Philippi" of the Abercrombie & Melvill list must therefore be regarded as a mere *nomen nudum*.

No. 3. The *Emarginula* (*Clypidina*) *radiata* was described by Gould from

[1] Preston, Records Indian Mus., vol. vi, p. 39, *Acmæa Travancorica*.

[2] Mem. Proc. Manchester Lit. Phil. Soc., ser. IV, vol. vii, p. 41, 1893.

[3] Enum. Moll. Sicil., vol. i, p. 115, pl. vii, fig. 13.

[4] Thesaurus Conch., vol. iii, p. 212, pl. 246, fig. 33.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sydney Harbour, and was supposed by Tenison-Woods to be the same species as *E. australis*, Lamk. As Lamarck never described an *E. australis*, possibly the species characterized under that name by Quoy & Gaimard was referred to.

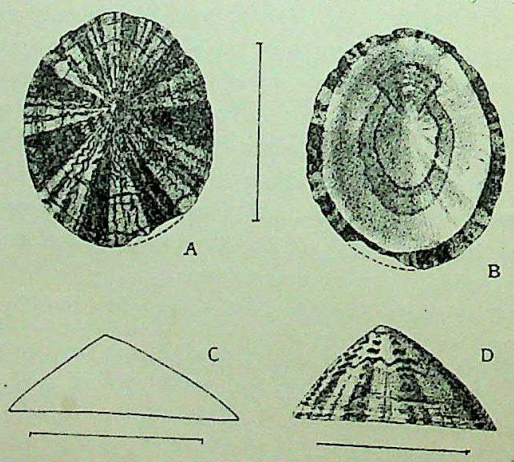
I have not seen any specimens from Bombay, so cannot confirm the identification by Mr. Abercrombie. The species, however, should be placed in the genus *Subemarginula*. It has never been figured, and without examining the type it is almost impossible to know its true relationship.

No. 5. *Patella aster*, Reeve, appears to be the only species of the genus hitherto met with at Bombay. It is variable in colour; the white rays, which are inconstant in number (although nine are often observable) are hardly visible externally in some specimens. In the type the nine rays are very striking, as the shell figured by Reeve has been much cleaned. In one example collected by Major Peile the dark rays are so broken up that the markings hardly look like radiations.

Pilsbry (Man. Conch., vol. xiii, p. 147) unites this species with the *Patella novemradiata* of Quoy & Gaimard, described from the Mauritius, but as I do not feel convinced of the certainty of the identification I prefer to name the Bombay shells *P. aster*, about which there is no doubt, since a comparison of the series of specimens collected by Major Peile proves their identity beyond question. It seems to me more likely that the Mauritian *novemradiata* may be a form of one of the African species, e.g., *rota*, Gmelin, or *capensis*, Gmelin. The animal of *P. aster* has not hitherto been studied, but an examination of the radula shows that this species belongs to the genus *Helcioniscus*, in which it is located by Pilsbry.

ACMÆA BOMBAYANA, n. sp. Figs. A-C.

Testa ovato-rotundata, mediocriter elata, vertice paulo antemediani, fusco et albo radiata, interdum minute fusco reticulata, radiatim tenuiter striata, striis incrementi tenuissimis sculpta; radii albi, sæpe in paribus



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

dispositi, radio fusco intermedio quam cæteris pallidiori divisi; facies interna alba, area centrali pallide olivaceo-fusca, limbo definito albo et rufo-fusco notato, haud crenulato. Long. 17·5, diam. 15, alt. 6·5 mm.*

About the same form as the Bombay *Patella aster*, but differing in other respects. *Acmæa parasitica* (d'Orbigny) is a little like the present species, but rather more ovate, and "arched in every direction in consequence of attaching itself to other shells" with convex surfaces. On the contrary all the specimens I have seen of *A. Bombayana* appear to have rested upon flat or almost level surfaces, as the margin is even and unarched all round.

The rays are generally of two shades of brown, some much darker than others, and the paler ones nearly always falling between the white rays, which frequently appear to be in pairs. In addition to the rays a fine brown and white reticulation not infrequently occurs. The fine radiating thread-like lines are only observable in well-preserved specimens. The interior is thickened with a white callus deposit, excepting the central portion, which is stained a pale livid olive and defined from the white part of the interior by a distinct horseshoe-shaped margin. The outer limbus is thin, sharply defined, and prettily marked with the ends of the brown and white rays.

Var. CEYLANICA. Fig. D.

Like the type, but a trifle more elevated, without the fine brown reticulation, but with the darker rays commencing as spots or dots near the apex. Largest specimen 19·5 mm. in length, 16 in diameter, and 9 high.

Hab.—Galle, Ceylon (H. F. Blanford).

The increased elevation of this variety is probably due to its occurrence in a more exposed position than the Bombay shells. It has been observed with regard to our common limpet, *Patella vulgata*, that specimens occurring near high-water mark, and consequently more exposed to the breaking of the waves, are higher and more conical than those found lower down on the shore.

The *Acmæa Travancorica*, Preston, has an arched lateral basal margin, is differently coloured ("pale brownish yellow with occasional blotches of dark purple"), and more roughly sculptured. The colour of the interior of the shell is not described, but it is merely said to be iridescent. The margin is described as "regularly spotted with purple." This iridescence and the apparent absence of a defined limbus or border seem to indicate that this species has more affinity to the Patellidæ than the Acmæidæ.

---

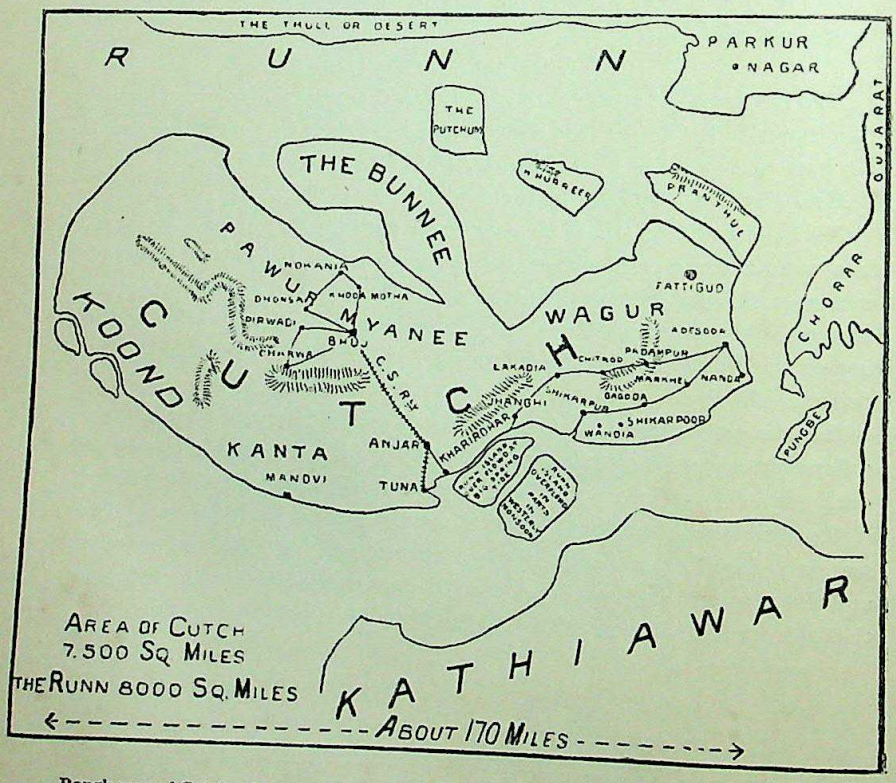
* An average specimen. The shell figured is 22 mm. in length, 19 high and 7 in height.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PROGRESS OF THE MAMMAL SURVEY.

When the last report was published (page 229 of the last Journal) Mr. C. A. Crump, the Society's first Collector, had finished his tour in the Berars. As the rains were approaching it was decided to send him to Cutch and he arrived there on the 6th July 1911. H. H. the Rao Saheb and H. H. the Kumar Saheb being both keen naturalists as well as sportsmen lent our Collector every assistance, and as a result the Cutch collection is a fairly representative one. H. H. the Rao Saheb has kindly consented to fill in the few blanks which were left. Mr. Crump collected at Bhuj, Rhoda Motha, Nokania, Dhonsa, Charwar, Pirwadi, Anjar, Gagodar, Makhal, Nanda, Adesoor, Padampur, Chitrod and finally worked back to Bhuj, finishing early in October. He obtained some 350 specimens, all of which will be described in Mr. Wroughton's report in our Journal in due course. Amongst the specimens was



Rough map of Cutch—drawn by Mr. C. A. Crump - showing the places visited by him when collecting mammals.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a new genus of rock-rat which Mr. Wroughton describes in this Journal (page 340) under the name *Cremnomys cutchicus*.

Mr. Crump returned to Bombay and started for the Central Provinces in October commencing at Asirgarh and then collecting at Hewra, Siwal, Mandwa, Chandgarh, Ganoor, all in Nimar, and up to the end of December had obtained some 167 specimens. Unfortunately he has not been able to obtain much assistance so far from the natives in the C. P., and has found them unwilling to help even when they are offered money for specimens. He writes, "a very little help from the natives and I could have got foxes, but the people of Nimar have not the faintest notion of shikar; they ran down a few hares and caught some rats in their huts, nothing more. I offered Rs. 3 for a porcupine and up to Rs. 5 for large mammals that were out of the ordinary. I offered rewards if they would show me 'earths' or other hiding places, but there was no response."

Mr. Shortridge, the second Collector, arrived in India on the 20th October 1911, and started collecting at once at Dharwar in the Southern Mahratta Country. The Society are under a great obligation to Mr. R. M. Phillips, the District Superintendent of Police at Dharwar, for the invaluable assistance he has given to Mr. Shortridge, who in writing says that in consequence of Mr. Phillips' assistance there has been no dearth of specimens from the first, whilst every difficulty has been removed. Mr. Shortridge obtained some 571 specimens from Dharwar, Devikop, Gadag (where Mr. T. J. Spooner, C. E., an old member of the Society, rendered him much assistance) and Potoli, all in the Dharwar district.

Mr. Shortridge is now in North Kanara and proceeds south through Kanara into Mysore territory and gradually into Southern India.

"The Field," commenting on the progress of this Survey in their issue of the 10th February 1912, states: "So far, therefore, as the Survey has hitherto extended, it tends to show that India has been thoroughly well worked in respect of its mammalian fauna; most of this work, it should be remembered, having been accomplished by amateurs." Such a statement as this is not calculated to help the Society in the work they have undertaken nor is it fair to draw such general conclusions from the first report of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mammal Survey. A glance at the original prospectus issued by our Society in connection with the Mammal Survey would have revealed the reasons why it was undertaken, not to try and discover new species, but because "no systematic collection of the mammals of India has been made since the time of Hodgson, Horsfield, Elliot, Sykes, Jerdon, and Blanford. . . . . a few private volunteers, Colonel Ward, Major Dunn, Major Magrath, Mr. Whitehead and others, have lent a helping hand in recent years, but progress in this manner has been necessarily very slow." The lack of specimens of Indian Mammals in the National collection at the British Museum (Natural History), South Kensington, is deplorable,* and it is with the idea of helping our own collections as well as that of the National collections that the Survey was resolved upon by our Society. The Survey was not undertaken merely to obtain new species, otherwise we should not have commenced by sending our Collectors to Khandesh and Dharwar, and Mr. Wroughton from the British Museum (Natural History), writing on 5th February 1912, says, "the topotypes in the Dharwar lot are invaluable, the first really firm foundation we have had."

This is sufficient encouragement to us.

As regards finance, when the last Journal was published some Rs. 20,816 had been received for the special fund for carrying on the Mammal Survey. Since then the Society has received some Rs. 5,582, so that the total received up to date is Rs. 26,398, out of which Rs. 9,879 has been spent.

The Survey with only two Collectors will take several years to complete and therefore we must try and obtain a further Rs. 25,000 or Rs. 30,000. This should not be very difficult as our members will surely appreciate the value of the work as it proceeds, and as they see the results being published in Mr. Wroughton's reports in the Journal. The first report (Khandesh) appears in this number (page 392) and the 2nd (Berars) and 3rd (Cutch) have also been received and will appear in the next number of the Journal.

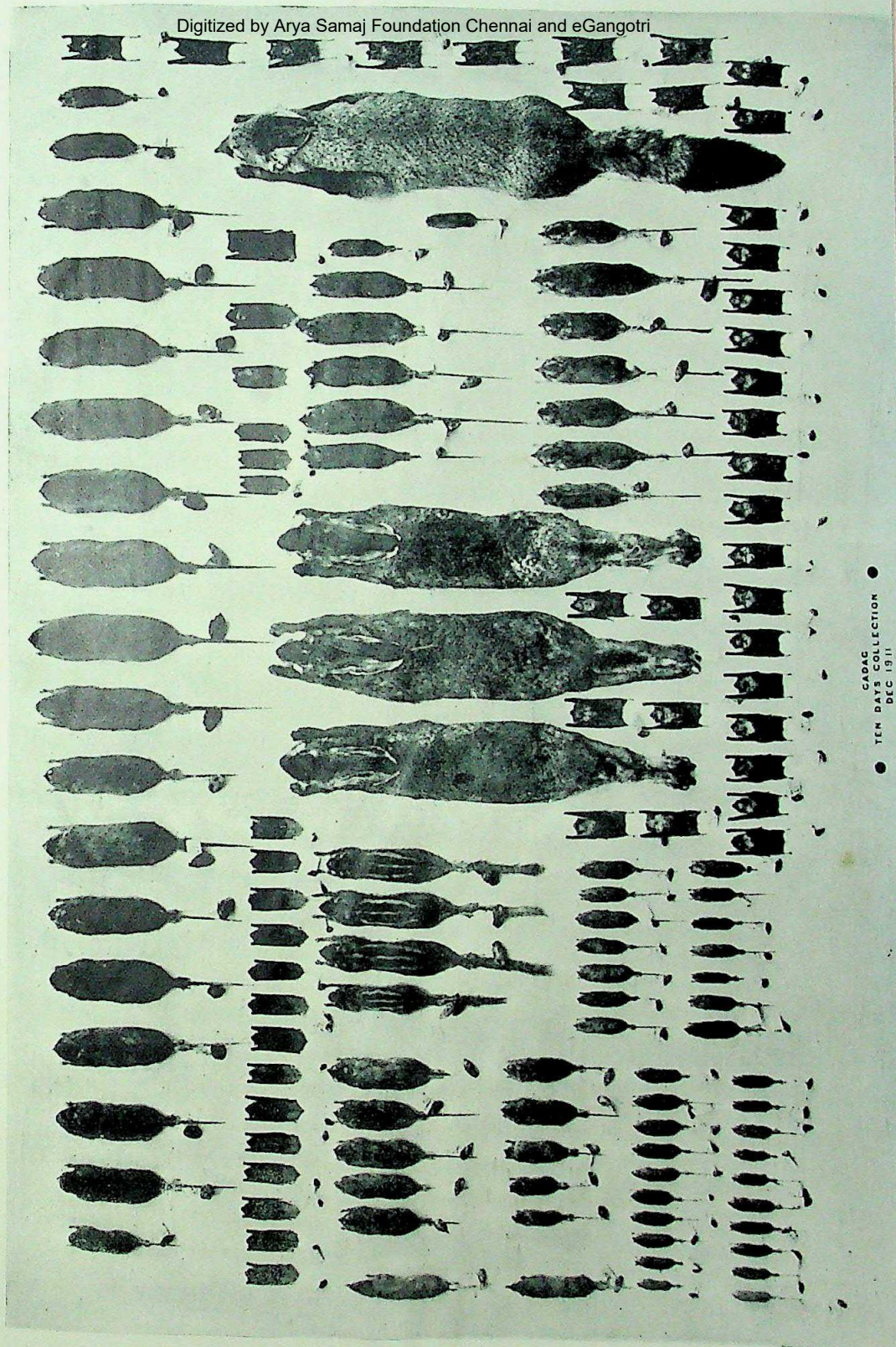
March, 1912.

---

*Mr. Oldfield Thomas in our original prospectus wrote as follows :—"There is no doubt that the representation of our Indian Mammal Fauna in the National Museum has fallen behind other parts of the world and is very far short of what it should be."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MAMMAL FUND.

FURTHER LIST OF SUBSCRIBERS.

NAME.	Amount.		
	Rs.	A.	P.
Amount previously acknowledged in Journal No. 1 of Vol. XXI	20,816	2	0
"Another Piffer"	50	0	0
Bikaner, H. H. the Maharaja of	1,000	0	0
Blunt, A. W.	15	0	0
Burns, Cecil L.	50	0	0
Brodie, D	25	0	0
Broughton, Capt. T. D.	15	0	0
Bute, The Most Hon. Marquis of	1,427	3	0
Budd, Lt.-Col. N. A. H. (2nd Donation) ..	50	0	0
Chamba, H. H. the Raja of	150	0	0
Clifford, Capt. R.	10	0	0
Cook, J. P...	15	0	0
Culbertson, T. M. S.	15	0	0
Currey, Capt. V. F.	30	0	0
Dallaporta, J. N.	15	0	0
Deane, Dr. A. H.	15	0	0
Dewas (Junior), H. H. the Raja Saheb of ..	100	0	0
Dumayne, Sir F. G. (2nd Donation)	10	0	0
Fraser, W...	50	0	0
Fyson, P. F. (2nd Donation)	15	0	0
Gilbert, Reginald	25	0	0
Heath, R. H. (2nd Donation)..	10	0	0
Hide, P.	50	0	0
Hulbert, Major J. G.	10	0	0
Hunt, Capt. A. T.	45	0	0
Indore, H. H. the Maharaja Tukojirao Holkar of.	1,000	0	0
Jeejeebhoy, Sir Jamsetjee, Bart.	100	0	0
Jenkyns, H. H.	15	0	0
Joly, P. B...	15	0	0
King, R. C. H. Moss. I.C.S.	15	0	0
Kolhapur, H. H. the Maharaja of	200	0	0
Lewis, J. S.	15	0	0
Lucknow, Provincial Museum..	200	0	0
Mossent, P. G.	15	0	0
Millard, W. S. (2nd Donation)	200	0	0
Moberly, C. N.	25	0	0
Montagu, The Hon'ble E. S.	99	0	0
Morris, Major R. L...	20	0	0
Nevill, Thos. N. C.	15	0	0
Norman, H. C.	15	0	0
Perfect, S. R.	25	0	0
Perreau, Capt. G. A.	15	0	0
Petit, Sir Dinshaw M., Bart.	50	0	0

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Name.	Amount.		
	Rs.	A.	P.
Phillips, Capt. E. H.	20	0	0
Pickthall, Capt. J. W.	15	0	0
Peall, Lt.-Col. S. E...	56	0	0
Purkis, F. C. (2nd Donation)	10	0	0
Reichwald, Capt. W. F.	15	0	0
Rogers, K. St. Aubyn	10	0	0
Sale, E. L., I.C.S. (2nd Donation)	25	0	0
Slade, Rear Admiral Sir H. E. (2nd Donation) ..	60	0	0
Suter, Dr. M. F. (Rs. 10 per month for January, February and March 1912)..	30	0	0
Tweedy, A. G.	10	0	0
Tyabji, S. B. (2nd Donation)	10	0	0
Tyler, H. H. F. M., I.C.S.	30	0	0
Ward, Major C. H. (2nd Donation)	15	0	0
Whistler, H. (2nd Donation)	5	0	0
Wickham, P. F.	25	0	0
Witt, D. O.	10	0	0
Total ..	26,398	5	0

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

REVIEWS.

"FORTY YEARS AMONG THE WILD ANIMALS OF INDIA."

(SOME NOTES ON A NEW BOOK.)

Above is the title of a book recently published, the author of which is Mr. F. C. Hicks, late Deputy Conservator of Forests. It deals especially with tiger shooting, but apart from this the author has expressed opinions on two subjects to which I wish to invite attention.

I.—GAME PRESERVATION.

In his delightful book "Leaves from an Indian Jungle," Major Glasfurd some years ago gave a startling account of the extent to which game is destroyed in the Central Provinces by native shikaris who sell the skins and heads to traders, and shewed that there exists a very considerable trade in shikar trophies which there is at present apparently no means of checking.

Mr. Hicks now furnishes us with some equally remarkable information as to the sale of the flesh of game in some districts. For instance, he writes of the Dehra Dun district "With Dehra and Mussoorie within easy reach there is always a good market for the sale of venison and other game. Consequently the reader may go at almost any time of the year to the Dehra bazar and at a certain butcher's shop he will be able to buy venison at two annas a seer; this, with mutton selling at five annas a seer in itself speaks for the amount of deer that must be slaughtered for this market." Again, after mentioning the sale of pheasants' eggs at Mussoorie at a much cheaper rate than fowls' eggs, he continues "I also know of several hotels which maintain a number of professional shikaris, whose business it is to obtain game for their hotels."

Again, "It may be argued that the cases I have mentioned are exceptional owing to the proximity of two large towns, such as Dehra and Mussoorie. But this is so only in the matter of degree * * * * * I was camped lately near a group of villages in the heart of a large jungle. I sent my servant to a butcher whom I had heard of at one of the villages. His reply was that he only killed domestic animals once a week, as it did not pay him to kill more on account of the amount of deer that the local villagers shot or trapped. I found the same demand to exist all over the Central Provinces and Mysore, no matter how uncivilised or out of the way the places might be."

Of course there is little that is really new in this, while, as Major Glasfurd has pointed out, the root of the trouble lies in the number of guns in the possession of native shikaris, and the extreme difficulty of satisfactorily enforcing game regulations by means of more or less venial native subordinate officials so long as these guns exist.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I am not sufficiently conversant with the subject to discuss the difficulties in the way of reducing the number of guns, but it seems probable that but a small portion of these are needed for the protection of cultivation against the depredations of game, and that there is room for a large reduction in the number of licenses now granted, assuming that in the majority of cases the native shikari's possession of his gun is legal under existing conditions.

But the main point to which I wish to invite attention is that all or nearly all the illegal slaughter of game that goes on is for profit, whether by sale of horns, skins, or flesh. Put an end to the demand and the supply will cease. This is Mr. Hicks' contention, with which I for one am entirely in agreement. What he would do is to prohibit by law the sale or purchase of game in any form whether flesh, skins, horns, or feather. It does not seem that there would be anything unreasonable or impracticable in such a prohibition, though certain exceptions to the general rule might be found advisable.

Since writing the above I have learned that a new Bill on the subject of Game Preservation, prepared after consultation with the Local Governments, is now under consideration by the Secretary of State. Whether it contains any provisions against the traffic above mentioned is doubtful. In any case, as this bill will presumably come up before the Legislative Council before very long the present juncture would seem not inopportune for calling attention to the subject. Is it too late for the Society to make a representation in the matter? If there be any doubt as to the need for some action it should be possible with the Society's present large membership to obtain within a short time a sufficiency of information upon which to form an opinion.*

II.—Two species of Panther.

I had imagined that in spite of opinions to the contrary, specially among an earlier generation of Indian sportsmen, science had decided once for all that there was no specific distinction between the large "panther" and the smaller "leopard" of some writers. This for the reason that a large series of animals shows such a number of intermediate variations between two types in size, colouring, length of tail and even shape of head that it is impossible to separate them.

In this connection Mr. Lydekker writes, however, that if the two forms are, as a whole, distinguishable and restricted to particular localities, they

* Mr. Dodsworth's interesting article on the "Protection of Wild Birds in India" in the last number of the Journal affords evidence of the success of recent legislation directed against the Indian Plumage Trade, and encourages one to hope that the efforts of Mr. Hicks and others on behalf of the deer, &c., may not prove unavailing.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

are undoubtedly entitled to recognition, *e.g.*, as "geographical forms" not as distinct species.

Mr. Hicks, has no doubts on the subject, defining two distinct species as below :—

(I) The Panther, with the following characteristics :—

(*a*) Weight about 150 lbs.

(*b*) Length of body alone about 5 feet, length of tail about 2 feet.

(*c*) Smooth shining coat with clearly defined rosettes.

(*d*) Longer and more pointed skull with strongly developed occipital ridge.

(*e*) Having 22 caudal vertebræ in the tail.

(II) The "Pantheret" :—

(*a*) Weight about 50 lbs.

(*b*) Length of body about 3 feet, length of tail 2½ to 3 feet and more.

(*c*) Shorter and rounder skull with no occipital ridge.

(*d*) A dull rough coat and blurred rosettes.

(*e*) Having 28 caudal vertebræ in the tail.

These dimensions are said to be those of an average animal in its prime, but both "species," especially the first, are admitted to vary considerably.

Now these differences are in the main those long recognised as existing between the typical "panther" and "leopard," but which have been weighed in the balance and found wanting. It is the final difference in the number of the caudal vertebræ that has captured my attention and induced me to write this note.

I am unaware whether Mr. Hicks is the first to call attention to this character. But if the difference is a constant one and no intermediate variations occur, we have surely here a permanent structural difference which absolutely warrants specific distinction. With the number of shikaris there are among the members of the Society in different parts of India it should not be difficult to decide the question.

Apart from this point, the author's differentiation would leave me unconvinced. My own experience in this direction has been mainly confined to North Gujarat; during 2½ years in the Mahi Kantha Agency I measured a sufficient number of panthers to afford a fair idea of the average size; I find that I have a record of 19 adult specimens shot in that district, of which I give the following particulars for what they may be worth :—

Length of body (in a straight line) varies in 11 males from 3 feet 7½ inches to 4 feet 6½ inches, in 8 females from 3 feet ½ inch to 3 feet 7½ inches. Length of tail varies from 2 feet 2 inches to 2 feet 9½ inches. In colouring and comparative smoothness of coat the larger individuals correspond more or less to Mr. Hicks' "panther," the smaller to his "pantheret," with some intermediate variations. But in view of the great

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

difference between the average size of Mr. Hicks' two species I should find it extremely difficult to place these Gujarat animals, not having in those days ever thought of counting the caudal vertebræ.

The author is very severe on the sportsman who says he has killed a panther when he has shot an animal of the smaller type, which is rather unkind if one considers that modern scientists all tell the sportsman that the small beast is a panther.

To the ordinary use of the word "leopard" Mr. Hicks strongly objects. And of course he is perfectly right in pointing out that the original *leopardus* was undoubtedly *Felis jubata* (*Cynœlurus jubatus*). But when he remarks that "*pardus*" means "spotted," not "rosetted," implying that the animal known to the ancients as "*pardus*" was not the panther, I think, he is wrong; the panther is not the less spotted because his spots are arranged in rosettes. But in any case the ordinary use of the word leopard has existed for centuries, and is too general for there to be any hope of correcting the error now; the name panther indeed in its true application is hardly known out of India. Under the circumstances one cannot agree with the author when he stigmatizes the man who calls the panther a "leopard" as ignorant and immoral! More especially seeing that in spite of his zeal for correct nomenclature he invariably calls the gaur what it is not—a bison. The latter misnomer, if sanctioned by practice, is yet no more excusable than in the case of the leopard. While his spelling of "cheetle" for "chital" if original, is not to be admired.

However, these are trivial blemishes in what is one of the most remarkable books on Indian big game that has been written. Certainly no writer of whom I am aware has displayed a knowledge equal to this author's of the habits of the tiger, and his chapters on the theory and practice of beating for tigers deserve the sportsman's careful study. But I have no intention here of trying to review Mr. Hicks' book and have already written more than I meant to do. I will only add that the author records the shooting of an *undoubted hybrid between tiger and panther* of which he says "its head and tail were purely those of a panther, but with a body, shoulders and neck-ruff unmistakably of a tiger, the black stripes being broad and long though somewhat blurred and breaking off here and there into a few blurred rosettes, the stripes of the tiger being most predominant on the body." The animal was an old male and measured a little over 8 feet in length. This unique trophy unfortunately disappeared during the confusion, and subsequent illness of the author, that followed on a severe mauling which he sustained. Is there any other record of such a hybrid at any rate in the wild state?

A. H. MOSSE, CAPT., I. A.

DWARKA, *September* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MEDICAL ENTOMOLOGY.

Entomology for Medical Officers: By A. Alcock, C.I.E., M.B., LL.D., F.R.S., etc., Lecturer on Medical Entomology, etc., at the London School of Tropical Medicine. Lately Superintendent of the Indian Museum, and Professor of Zoology in the Medical College of Bengal. Sometime Surgeon-Naturalist to the Indian Marine Survey. London, Messrs. Gurney and Jackson, 1911, Price 9 shillings net.

The publication by Colonel Alcock of an Entomological Text-book will come as a surprise to those who know him as one of the leading authorities on the abyssal fauna, but it cannot be said that the admirable work before us has suffered in being written by one who is a naturalist in the true sense of the word, not merely a specialist in the narrow sense. For some years past Colonel Alcock has been occupied in organizing and conducting in the Seamen's Hospital at the Royal Albert Docks a course of medical entomology for doctors, missionaries and others interested in tropical medicine. His "Entomology for Medical Officers" is therefore the result not merely of theoretical knowledge but of practical experience. Perhaps the most striking feature of the book is its remarkable lucidity. It is not an easy task to give students to whom "entomology is a means rather than an end," a precise idea of the classification and structure of those Insects, Arachnids and other Arthropods—for the scope of the work is not limited to the Insects in a limited sense—that are noxious to man's person. That this has been achieved no one who reads "Entomology for Medical Officers" can doubt. Further, a great simplification has been introduced into the classification of the mosquitoes, especially of those which belong, in a wide sense, to the genus *Anopheles*; so that we are now within reasonable distance of a complete revision of the Culicidae in which the accumulation of "bad" species and worse genera that the last few years have produced will be swept away and it will again be possible to regard an interesting family of Insects not merely as a happy hunting-ground for the species-monger but as a legitimate object of study to the zoologist; for no scientific study of any group of animals can be successful so long as it is viewed from a prejudiced standpoint that encourages the production of hasty work, and in the case of a group of great practical importance it is the ordinary man, not merely the zoologist, who suffers from hasty work such as that recently lavished on the Culicidae. Colonel Alcock is a doctor as well as a zoologist, and it is his good fortune also to be endowed with a literary style of uncommon merit. No better trial of qualifications could be imagined in the production of a text-book on medical zoology, so long as no one of them is allowed to dominate the rest, and in this case the three are united in perfect harmony by experience. The book can be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

recommended not only to medical men, but to all who are interested in insects, their structure and their habits. The many illustrations, although of a simple nature, show what they are meant to show, and are not mere embellishments. The book itself is easily handled. Would that such works were commoner in entomology!

N. A.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

OBITUARY NOTICE.

E. W. Oates.

The death of Mr. Eugene William Oates, which occurred at Edgbaston, Birmingham, on the 16th of November, will be greatly regretted by all ornithologists and more especially by those who have made a study of the Birds of India. For some years past he had been in failing health, and his death at the comparatively early age of 66 was therefore not unexpected.

Mr. Oates was an officer in the Public Works Department in Burmah from 1867 to 1899, and rose to the highest positions in that branch of the service. He was an ardent naturalist, and all his spare time was devoted to the study of his favourite science.

As an ornithologist Mr. Oates had few equals, and will long be remembered for the excellence of his writings. When in England in 1882-83 he spent much of his time at the British Museum, Bloomsbury, in preparing his first well-known work "*A Handbook to the Birds of British Burmah.*" Subsequently he wrote the first and second volumes on Birds in the *Fauna of British India*, edited by the late W. T. Blanford—which volumes may justly be regarded as models of what such works ought to be. The present seems a fitting opportunity to explain a ridiculous passage which appeared in the otherwise admirably written second volume and which has long puzzled ornithologists. In volume ii, p. 290, Oates (apparently) writes that the note of the Streak-eyed Wagtail *Motacilla ocularis* is "a prolonged Pooh." The explanation of this remarkable statement may now be given, the author and editor, as well as the perpetrator of the joke being now, alas, dead. When Oates was in the middle of preparing his second volume, at the Natural History Museum, the writer and the late Dr. Sharpe happened to pass the table covered with his manuscript on their way to lunch, and Sharpe, who loved a joke, said "let us add something funny to Oates' description of this Wagtail," little thinking that his remark would ever get into print. He never doubted that the eagle-eye of the author would detect and strike out the line, after having a laugh over it, knowing the source from whence

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

it came. The incident was forgotten, the volume completed and Oates returned to India. The revise proofs were sent to him by Blanford for correction and passed, but the long forgotten joke unfortunately remained unnoticed! Thus it happened that a Wagtail was described as having an impossible note, which has long been a puzzle to ornithologists—a warning to all practical jokers.

His other well-known works included a second edition of "*Hume's Nests and Eggs of Indian Birds*" and a "*Manual of the Game Birds of India.*" He also wrote the first and second volumes of the "*Catalogue of the Collections of Bird's Eggs in the British Museum,*" and was joint author with Capt. Savile G. Reed of the third and fourth volumes of the same work.

Mr. Oates was an accurate observer in the field and his fine collection of Burmese Birds and their eggs now forms part of the National Collection.

In the last years of his life he was deeply interested in that most difficult group of Kalij and Silver Pheasants which are included in the genus *Gennœus* and he formed a fine collection of these birds which was transferred to the Natural History Museum shortly before his death. His views on this difficult group of birds were much at variance with those of other ornithologists, and probably many of the individuals which he regarded as representing species or sub-species should really be considered as hybrids, which undoubtedly occur among wild birds of this group. His collection, however, contained many types and the Trustees of the British Museum were fortunate in acquiring it.

Mr. Oates was elected a member of the British Ornithologists' Union in 1884 and acted as Secretary from 1898 to 1900: he also joined the British Ornithologists' Club in 1893, soon after its commencement. He was a Fellow of the Zoological Society of London, &c., and a popular member of the Savage Club.

W. R. O. G

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MISCELLANEOUS NOTES.

No. I.—THE NUMBER OF CUBS IN A TIGER'S LITTER.

In May 1911, I was out in the C. P. after tiger, when a tigress was shot. On being skinned it was found that the uterus contained 4 fœtus, within a few weeks of being born. I took measurements and they were :—

Length of body	.. ..	12 inches.
Length of tails	.. ..	6 inches.
Total	..	18 inches.

Their skin was properly formed, coloured and striped, and the bones and teeth hard and firmly set. It was only the absence of preserving liquids and jars that prevented me bringing them back.

Another tigress I shot had a family of 3 cubs a few months old, but although I often saw their tracks, I never got a glimpse of them. I have also heard of many litters of three. I see W. S. Burke in his *Indian Field Shikar Book*, says concerning cubs that "seldom more than two are *reared*"; does this mean that one or two always die or get killed, for as far as I have heard, 3 in a litter seems very common, while only 2 rather unusual.

C. R. S. PITMAN, 2ND LT.,
27th Punjabis.

ALIPORE, *August* 1911.

No. II.—THE STOAT IN KASHMIR.

On the 15th August while ascending a high mountain, near Pahlgam, Kashmir, with a climbing party, and when crossing a snow patch at about 14,000 feet a coolie carrying the tiffin basket suddenly drew my attention to a stoat which was showing its head at the visible base of a point of rock jutting out of the snow. It ran out on to the rock and I had a good look at it through glasses, but the combined effect of a defective cartridge and an excited terrier prevented my securing it.

From its size, however, its chestnut colour above, its yellowish white underparts and the black tip to the tail I came to the conclusion it was an example of *Mustela erminea*, the Common Stoat. If the lair was under the rock where I saw it the situation was an extraordinary one, for the surroundings were nothing but bare rock and snow. And what this little carnivore could have found to live on in this inhospitable spot I could see no sign of.

KASHMIR, *September* 1911. H. A. F. MAGRATH, MAJOR.

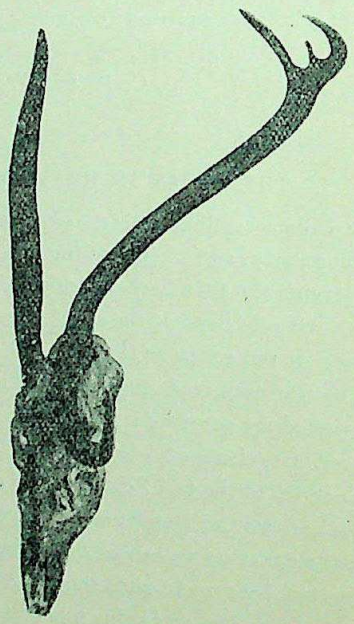
[It was unfortunate Major Magrath was unable to secure the specimen as it would have been interesting to see to what race this Stoat belonged, whether *M. whiteheadi* or *M. erminea*.—Eds.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. III.—A DEFORMED THAMIN STAG (*CERVUS ELDII*).

I enclose a photograph of a deformed Thamin head shot by me last March in Manipur. To bag a Thamin in Manipur necessitates hard work and early rising. Having chosen his ground the sportsman proceeds to build his basha on the edge of the swamp. The Thamin in Manipur keeps absolutely to the swamps, except perhaps during the rutting season, when he may be met in the long grass at the foot of the hills. The shikari wakes you up at about 3-30, and you should have left your camp by 4-0, an hour before dawn. As soon as light appears the stag moves off into deep water, where he is very difficult to follow, so it is very necessary to get a view of him early. After a stag has been seen he should not be followed unless he is actually moving away from you or until he commences grazing. His senses of hearing and seeing are acute. As a rule one can approach him from behind high patches of grass, taking care to move only when he is unlikely to see you. I was fortunate in bagging two fairly good heads last season (though neither reached 50 inches) and the deformed one.



The deformed head shown in the photograph seems quite unique. One horn, brow-antler and beam, is complete whereas the other has only the brow-antler and this, instead of growing forwards and upwards, takes a vertical direction. It is a much thicker and longer brow-antler than the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

other. There is no sign of a break from fighting or any other cause. When I shot this stag my shikari was extremely excited, telling me that the Manipuris say that in each variety of deer only one stag bears such a head, and any one who has one in his possession will be wealthy and healthy for the remainder of his life. I only hope this will prove true.

The measurements of this deformed head are :—

Left Horn : Beam 31¼ inches. Brow Antler 15 inches=46¼ inches.

Right Horn : No Beam. Brow-Antler 18¾ inches.

The best head bagged last year was shot by a Jemadar of the Regiment, measuring: —

Left horn : 49 inches. Right Horn 53¼ inches.

Two other very good heads were shot by Colonel Tytler measuring over 52 inches and 53 inches respectively.

A. H. D. BARRON,
17th Infantry.

MANIPUR, 11*th November* 1911.

No. IV.—DO CHINKARA (*GAZELLA BENNETTI*) DRINK WATER ?

W. S. Burke, in his *Indian Field Shikar Book* writes concerning the Chinkara, "It is said never to drink." I have had very little experience with Chinkara, but on two occasions within the last year I have seen them coming to drink.

In the C. P. last December every afternoon from 4 p.m. to 5 p.m. about 12 Chinkara used to come and drink either singly or in pairs at a road-side tank. Last June I also observed them, both bucks and does drinking from a river, near which I had pitched my tent. I do not know whether you have already had correspondence on the subject, but it would be interesting to know if others have noticed this.

C. R. S. PITMAN, 2ND LT.,
27th Punjabis.

ALIPORE, *August* 1911.

No. V.—INDIAN BREEDS OF SHEEP.

I shall be much obliged if any member of the Society can procure for me a skull of a ram of the four-horned breeds of sheep which Col. Godwin Austen said (*cf.* Proc. Zoological Society, 1879, p. 802) are carefully preserved in Kishtwar. The only specimen which he brought home of this remarkable breed, was destroyed many years ago, and I can find no description, figure or specimen of this breed anywhere in England.

Four-horned sheep are known in many countries, and we have in England no less than 3 distinct breeds in which 4-horns are common though not universal in the male sex.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Also I should be glad if anyone can give exact information as to the race or aberration, of sheep in Nepal, in which the rams have the two horns united in one. These sheep have been imported more than once to England, and there are living ones now in the menagerie of the Duke of Bedford. But as no females have been seen, it has been suggested that the junction of the two short upright horns is artificially proceeded, by binding together the horns of the lamb when young.

Another sheep about which I can find no recent or exact information is the large coarse woolled breed used in Ladak for carrying salt. Though a great deal has been written both by shikaris and zoologists about the wild sheep of Asia, yet so far as I can learn no one has as yet made any serious attempt to describe or illustrate the domestic races, and there is little doubt that a careful study of them, would have great economic importance. The Karakul breed from Bokhara has now been introduced to the United States, with the idea of producing the fine curly skins which are imported at a high and increasing price, under the name of Persian lambskins. Might it not be possible to breed these successfully in parts of the North-West Himalayas, or does the character of the wool degenerate in other parts of Asia? On this important question we know next to nothing.

COLESBORNE, NR CHELTENHAM, H. J. ELWES.
September 1911.

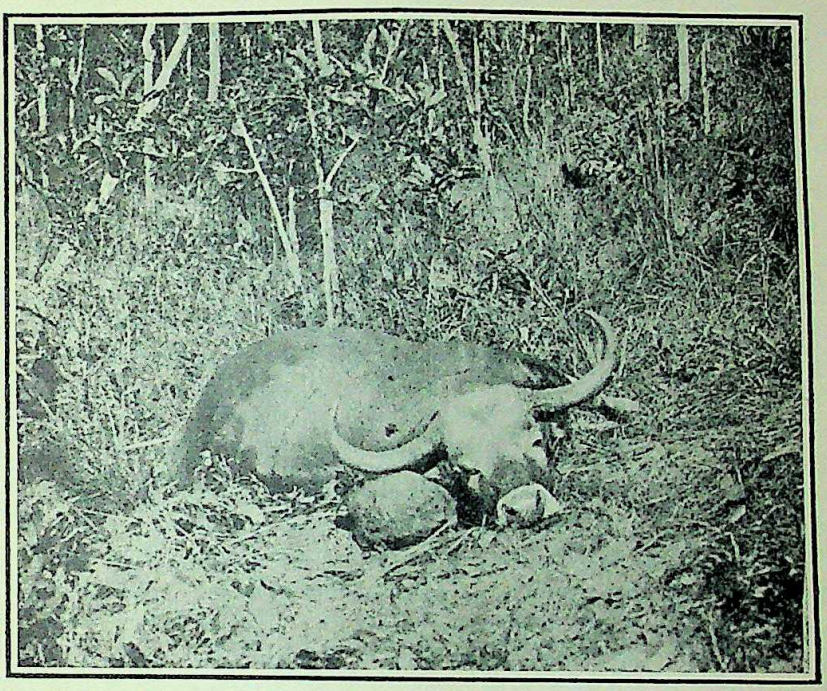
No. VI.—THE BANTING OR TSAING (*BOS SONDAICUS*).

Early in December 1910 I was fortunate enough to be marching through one of the uninhabited forest tracts of Upper Burma and after several days of moving camp halted in the middle of the forest for a day off. My camp was near a good stream and the hills along its banks are at certain times the haunt of tsaing (*Bos sondaicus*) so I thought it worth while to take a look round. I had an excellent old Burmese shikari with me and we left camp soon after seven and slowly walked up one of the spurs until we found a narrow winding game tract which we followed for a couple of miles. The grass was getting dry and the surface was hard and stony so I had on India rubber soled boots. Less than three miles from camp we came to a fork in the path and the old man hesitated for some time before taking the right hand path, a momentous decision as it chanced. We went on carefully looking out for tracts, myself in front and the two Burmans a little way behind. Within half a mile I suddenly spotted ten yards below the path a fine bull grazing among the scrubby trees and quite unconscious of an enemy's presence and was able without trouble to drop him in his tracks with a soft-nosed bullet behind the shoulder from a 500 high velocity rifle. He died almost at once and I thought it an excellent chance to return and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fetch my camera and was able to get the photo here reproduced after cutting away the scrub round him.



The length of the horns on the inside curve was 5 feet, distance from tip to tip 34½ inches, widest inside 37 inches, and girth of horn round base 15 inches. He was accompanied by a smaller bull as is so often the way with tsaing, and this one bolted at the shot giving me a glimpse of him through the jungle. There was great glee among the Burmans of course at such a fine haul of meat, and I was much amused at hearing a calculation being made of the number of cart yoke straps his hide would yield. Burmese cartmen usually fasten the yokes of bullockcarts to the holes by thongs. A long and gory procession descended from the ridge to the camp during the afternoon bearing blocksand strings of meat of all kinds and shapes and pemmican manufacture was soon in full swing.

DEHRA DUN, *November* 1911. A. RODGERS.

No. VII.—THE COLOURATION OF TIGERS.

When shooting last hot weather in the Central Provinces, I bagged two tigers at places quite 20 miles apart, and the difference in their colour was very marked. The first whose colour was very dark had a reputation for

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

keeping to the jungle; he was cunning and did not worry the villagers by raiding their cattle, although he was often heard at night. His mate was of the same dark colour. I shot her.

In the next case I again shot the tigress; but this time the first news I heard of the tigress and her mate was that they were both very bad cattle marauders. The colour of the one I shot was a very pale yellow. When reading Col. Fytche's book on Big Game I noticed that he remarks that the really bad cattle-stealing tigers were always reputed to have far paler skins than their less notorious brethren. I wonder if any of your correspondents have ever come across this, when out on shikar.

This second tiger had done great damage to cattle during the short time that I was in the shooting-block.

ALIPORE, CALCUTTA,
13th November 1911.

C. R. S. PITMAN,
27th Punjabis.

No. VIII.—A DEFORMED HEAD OF THE FOUR-HORNED ANTELOPE.

On the 18 June 1911, I shot what appeared to me to be quite a good Four-horned Antelope buck. He was a 100 yards away when I got him. On approaching I found that his right rear horn was missing. It had either never grown at all or it had been knocked off very early in his life. The actual measurements were as follows:—

Length of right rear horn	None.
Length of left rear horn	$3\frac{3}{8}$ inches.
Length of front right horn	$1\frac{7}{8}$ inches.
Length of front left horn	$1\frac{7}{8}$ inches.
Girth of rear horn	2 inches.
Girth of front horns	$2\frac{1}{8}$ inches.
Tip to tip: rear horns	....
Tip to tip: front horns..	$\frac{3}{4}$ inches.

ALIPORE, CALCUTTA,
13th November 1911.

C. R. S. PITMAN,
27th Punjabis.

No. IX.—THE PINTAIL DUCK (*DAFILA ACUTA*) SHOT IN SEPTEMBER.

When flight shooting in Kashmir on 21st September, I bagged a Pintail drake which was in either immature or eclipse plumage. The earliest recorded date hitherto for this duck in India is October.

KASHMIR, 1911.

H. A. F. MAGRATH, MAJOR.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. X.—OCCURRENCE OF EUROPEAN STRIATED SWALLOW (*HIRUNDO RUFULA*), IN KANGRA.

At the end of May I was marching along the road from Palumpur to the Bhuhu Pass in Kangra district, when on May 31st between Baijnath and Dhelu I met with a species of Striated Swallow—to quote from my note book, "another swallow was common—some Striated species, and I found three of their nests, built under ledges of rock. The first contained 4 white eggs, but they were nearly hatching and I could not save one. The nests are of mud and are of the shape of a half a cognac flask with long neck (section taken lengthwise) fastened underneath ledges. They are lined with a little dry grass and feathers. The second nest contained a fully feathered young Swift (*Cypselus affinis*). The third was ready for eggs." Finding the nests, I shot a bird for identification (skin register 407, ♂ 31. V. 1910, Dhelu, Maudi N. S.) which remained unnamed in my collection for some time. This skin was recently sent to England with others to Dr. C. B. Tichurst, M.B.O.U., who had it named by Dr. Hartert. He stated that it was undoubtedly *H. daurica scullii* (Seebohm). As this sub-species apparently corresponds to *Fauna of B. I.* No. 824, *H. rufula*, this note may be of interest. If observers along the Western Himalayas were to look out for this species, it would perhaps prove to be a well distributed breeding species.

H. WHISTLER,
Indian Police.

FEROZEPORE, *January* 1912.

No. XI.—NIDIFICATION OF THE TWEEDDALE SCIMITAR BABBLER (*POMATORHINUS NUCHALIS*).

On the 30th October I found a nest containing 2 fresh eggs and although I did not actually obtain the parent bird, I am quite sure it belonged to the Scimitar Babbler common in the locality—*P. nuchalis*. The eggs were pure white and glossy and measured ·93×·7. The nest was placed in a bamboo clump about 3 ft. from the ground and egg-shaped in form, the aperture being much closer to the top than the bottom; the lower part of the nest was a fairly deep cup. It was carefully lined inside with dried grass and packed exteriorly with dried bamboo leaves, so that the nest on first sight looked like a collection of leaves.

I think the 30th of October an unusual time of year for any of the babblers to be laying.

J. P. COOK.

THAYETMYO, 30*th November* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XII.—THE PARADISE FLYCATCHER (*TERPSIPHONE PARADISI*).

It is a curious thing that hitherto, as far as I am aware, the statement in the *Fauna*, Vol. II., p. 45, regarding members of the genus *Terpsiphone* "never descending to the ground," and their notes being "very harsh," has remained uncontradicted. So long ago as 6 years I noted that the song of the Paradise Flycatcher was in keeping with its appearance, and I regret that in notes on this species subsequently published I have omitted to correct the misstatement in the *Fauna*.

The song of *T. paradisi* is a series of sweet liquid notes descending the scale, then running up at the end and repeated 3 or 4 times. Although short it cannot fail to give pleasure to all who hear it, and can rank as a fine bird song. In Kashmir the song is continued up to the end of September if not later. I have seen this flycatcher descend to the ground on three occasions at least.

I trust that this belated note will serve to vindicate the character of *T. paradisi* at any rate.

H. A. F. MAGRATH, MAJOR.

KASHMIR, *September* 1911.

No. XIII.—THE CRAG MARTIN (*PTYONOPROGNE RUPESTRIS*).

The fact that the Crag Martin is subject to a seasonal movement along the Himalayas does not appear to have been noticed by Oates in the *Fauna*, Birds, Vol. II, p. 274, but there is no doubt that it is so.

Jerdon speaks of it as a "bird of passage," and writing more than 40 years ago Hume remarked that "on many of the higher hills south of the snowy range, it seems to a great extent to be a permanent resident, not at any rate migrating *en masse* from the country, but, as a rule, only retreating lower down the valleys in the cold weather; some few, however, during the latter season being met with in the higher hills of Central India and Rajputana. On the Neilgherries there appears to be a permanent resident colony." (Lahore to Yarkand, p. 177). As regards Chitral it is said to be a common summer visitor, appearing about the middle of April, and remaining till October. It breeds at all elevations there from 4,500 feet up to 13,000 feet. (J. B. N. H. S., Vols. XVI and XIX, pp. 55 and 914 respectively).

In the neighbourhood of Simla (7,000 feet), these Martins are usually to be seen in immense flocks about the third week in March (earliest date 19th March), and then again about the middle of October. On their arrival here, the Jungle Crows commit great depredations amongst them, and literally speaking gorge themselves on these helpless birds. I should think that very large numbers of them must come to grief in this way.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Excluding the few birds, which find their way down to the hilly districts in the plains, during the cold weather, it would be interesting to know the *lowest* elevation at which the majority remain, at that season, in the Himalayas.

Since Hume's time several Oölogists have taken the eggs of this bird, but none of them have put on record an exact and detailed description (*e. g.*, length and breadth, texture of surface, etc.) of the specimens.

The time of breeding of this species should be April to June, and Quetta should be included in its habitat. (J. B. N. H. S. Vol. XVII, pp. 831-32).

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 23*rd October* 1911.

No. XIV.—EXTENSION OF THE HABITAT OF THE COMMON KINGFISHER (*ALCEDO ISPIDA*).

In the "*Fauna*," Birds, Vol. III, p. 123, Blanford remarks that *Alcedo ispida*, Linneus, "is only wanting in the Himalayas, where it is rarely met with far above the base of the mountains, etc." It is, therefore, of interest to record that on the 15th May 1910, I procured a specimen, an adult male with testes slightly enlarged, in Keonthal territory, not more than 3 miles from Simla, at an elevation of about 5,600 feet. On the 26th April 1911 I again saw another bird in this locality.

It is undoubtedly a rare species in these parts.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 23*rd October* 1911.

No. XV.—NOTE ON THE COMMON KINGFISHER (*ALCEDO ISPIDA*).

It may be of interest to record that on the 23rd of September I saw a common kingfisher "take" a frog quite 1½ inches long in the body, and after hammering the same against its perch disappear with it into a hole in the river bank near by and almost immediately emerge with its bill empty. When conveyed to the hole the frog was carried longitudinally between the mandibles, its head being beyond the ends and its legs dangling on either site of the gape.

Now here were two remarkable occurrences. Firstly, this kingfisher taking a frog (and a comparatively big one) and from the Jhelum river swarming with small frogs, and secondly, considering the time of year, conveying it to a nest hole. The latter operation at once gives rise to the question what was in that hole? It can, I think, only be inferred that there was a mate sitting on eggs, for young in the nest would hardly be fed with such a mouthful as the frog in question. Now and again all through

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the month of September I noticed some of these kingfishers fly to holes with their captures and I have concluded that in Kashmir, breeding operations are continued up to the end of September.

As is well known this little kingfisher abounds in Kashmir. It is rather the rule than the exception to have at least one fishing from one's houseboat.

When perched for fishing the tail is depressed, except when it, the head and neck, are elevated with a short of oscillating motion. If the perch however is on the ground on top of the river bank, as it sometimes is, the tail is then kept elevated.

Occasionally this bird dives from the wing exactly after the manner of *Ceryle varia*. The poise and hover sometimes is quite as much as 12 or 15 feet.

H. A. F. MAGRATH, MAJOR.

KASHMIR, 1911.

No. XVI.—THE NOTES OF PALLAS' FISHING EAGLE (*HALIAËTUS LEUCORYPHUS*) AND SOME WATER BIRDS.

The "*Fauna's*" remarks on the note of Pallas' Fishing Eagle are "has a loud shrieking call note." As this description is rather vague and would hardly serve to identify the bird in localities where other raptorial birds with loud notes were common I would like to supplement it by observations of my own on this eagle. The note to my ear is a striking one. When heard in the distance it is not unlike that of the Herring Gull (*Larus argentatus*) when closer it runs off at the climax into a series of repetitions which bear a strong resemblance to the creaking which accompanies the working of block tackle. Whenever I heard the latter notes they reminded me greatly of the sounds one hears when a fishing fleet has come into harbour and the boats are lowering away and stowing sails. When very close a preliminary low croaking note is heard and the note last described sounds exactly like the clucking of a hen to her chickens only repeated with rhythm.

Several times I noticed that this eagle was much harried by a smaller one which, from the way it soared in small circles with wings above the horizontal, occasionally hovered, and from its long tail, I came to the conclusion was the Short-toed Eagle (*Circaëtus gallicus*). The mere approach of this latter when the former was perched in a tree was enough to start the "block tackle" working.

The Little Ringed Plover (*Ægialitis dubia*) has a dissyllabic note but one which at once distinguishes it from *Æ. hiaticula* with which it might easily be confounded even when observed at close quarters and through glasses, though the latter is, of course, a rare bird in India. This note is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

well rendered by the syllables "Tee-a," the note of *Æ. hiaticula* being a pretty plaintive "Tlü-eh."

I have never seen in print, what must have struck many observers, that the ordinary call notes of the Greenshank (*Totanus glottis*) and the Redshank (*T. calidus*) are indistinguishable. Yet such is the case I maintain. If there be any man who blindfolded could tell which is which from the notes then all I can say is that he has a wonderful ear. To the birds themselves, of course, their notes must be distinct. But the difference, whatever it is, can only lie in a very slight change of pitch and in volume of sound, the Greenshank, as being the larger bird, probably having the louder note. In the case of both species the note is monosyllabic and is ordinarily well expressed in writing by the syllable "Tyü" quickly repeated twice. Sometimes it is thrice repeated and I am inclined to think this is more often the case with the Greenshank than the Redshank. When rising alarmed the above syllable is rapidly repeated several times and I have heard it so repeated as many as 12 or 15 times in this case the species being the Greenshank.

The note of the Wood Sandpiper (*T. glareola*) is disyllabic and resembles the syllables "Tchikkit."

The Green Sandpiper (*T. ocropus*) has a monosyllabic note like "Twit" repeated 2 or 3 times when taking to flight.

A note of the Little Indian Grebe or Dabchick (*Podicipes albipennis*) which is peculiar, is a shrill prolonged whirring sound running down the scale. It may be likened in fact to a prolonged shrill whinny.

H. A. F. MAGRATH, MAJOR.

KASHMIR, 1911.

No. XVII.—IMMATURE PLUMAGE OF LAMMERGAYER (*GYPAËTUS BARBATUS*).

When shooting in the neighbourhood of Kalabagh on the River Indus in the early part of the year I was struck by the abundance of Lammergayers and asked the Malik of Kalabagh to try and get me a clutch of their eggs. This he very kindly promised to do and set his shikaris on to the task with the result that two rock eyries were found. About the 1st March one of the nests, which could be examined with glasses from a neighbouring rock was seen to contain eggs, but on attempting to take them the Malik's men found that even with ropes they could not get to the nest. The other nest was reached and found to contain one nestling which was brought to me in Rawalpindi on March 3rd. Lammergayers are not often seen in captivity; it may be worth while to note the bird's growth of plumage.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

When received it was covered with thick down of a dirty brownish grey tint, the sides of the head being a darker and browner colour. Tail and wing quills of a dark brown colour were sprouting, as well as wing coverts of dark, and light brown. The scapulars were well grown, forming two conspicuous patches of dark brown. On the sinciput was a rough patch of dark feathers, and a few similar feathers were apparent on the sides of the breast. On the lower back was a very small patch of light and dark brown feathers. The tarsus was well covered with down. The soft parts were as follows:—iris, brown; *bill* olive grey with a black tip, the base and gape being plumbeous blue. Eyelids and bare shelves above the eyes plumbeous blue; feet, lead flesh; claws, black.

The bird was about the size of a small goose and rather noisy, giving vent to a curious shrill squeak; it was very voracious.

The scapulars were the first feathers to attain their full growth, followed by the other feathers more slowly until about the 19th April, when I again described the bird, it was almost completely feathered.

On that date the head was sparsely covered with pointed black feathers which growing more thickly on the crown formed a conspicuous patch terminating in a point on the sinciput; from this patch a distinct line of feathers ran down each side of the head to the ear coverts. The bristles on the chin and pores were very prominent. The entire neck was covered with dirty pepper-and-salt coloured down which extended in a darker tint to the patch of feathers on the crown; the chin and upper throat were very sparsely feathered and down the line of the throat a few blackish feathers tipped with white were mingled with the down. The scapulars were large and prominent of a glossy black colour with glistening shafts and lighter centres; the mantle was similarly coloured but most of the feathers, especially towards the sides, were tipped with dirty white, giving the effect of a rough chevron. The lower back and rump were a mixture of grey, dirty white, and smoky black. The quills of the wings and tail were black with a slight purplish gloss, and the greater wing coverts were similar but brown. The remaining coverts were smoky black with light shafts, marked in a few places with white. The under parts including the thighs and underwing coverts were a mixture of smoky brown and white with the exception of the feathers on the lower edge of the crop which were smoky brown alone. The tarsi were feathered except posteriorly. Iris, clear hazel; sclerotic membrane reddish yellow. Nictitating membrane whitish. Feet greenish white with black claws.

The bird's plumage now remained the same until the beginning of July when black lanceolate feathers began to struggle through the down on the back of the neck, and by the middle of September that portion was thickly clothed and the plumage complete.

The bird was most noisy, uttering a squeaking note and also on occasion

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a kind of quack; although it allowed me to handle it freely it would chase any of the servants to which it took a dislike. Here my notes end, as by the kindness of our Honorary Secretary arrangements were made to ship the bird to England and it sailed on October 9th, in the "City of Athens," *en route* for Regents Park.

FEROZEPORE, *October* 1911. H. WHISTLER, I. P.

No. XVIII.—OCCURRENCE OF THE GOSHAWK (*ASTUR PALUMBARIUS*) IN SIND.

On the 10th of this month two men brought me an immature Goshawk, *Astur palumbarius*. She, for it is a female, is a particularly fine specimen and, according to the men who caught her, was captured while killing their tame partridge not far from Karachi. I have no doubt that the bird is a wild specimen and not an escaped one as if the latter she would have the usual marks on her eyelids of the thread used to sew them up, and besides it is full early for a purchased bird to be brought as far south as this. I think, therefore, that this may be taken as an instance of the occurrence of the Goshawk in Sind.

RAYMOND W. COOPER.

KARACHI, 12*th October* 1911.

No. XIX.—EXTENSION OF THE HABITAT OF THE BRAHMINY KITE (*HALIASTUR INDUS*).

In the *Fauna*, Birds, Vol. III., p. 373, Blanford makes no mention of the fact that *Haliastur indus* (Bodd) is found in the N.-W. Himalayas, but it is true nevertheless that this species ascends these mountains to at least 5,500 feet, and is apparently a permanent resident here. My friend, Mr. Alec. Jones, was the first to draw my attention to this, and I give below the dates and localities, in the neighbourhood of Simla, where this kite has been observed during the last three years or so.

(*a*) A single bird seen on the 4th July 1909 near the Keonthal stream, between Chail and Simla.

(*b*) A single bird seen again on the 24th June 1910 near the stream facing the Keonthal Raja's Palace.

(*c*) Several birds, both adults and young, seen after this in the vicinity of the septic tanks between Simla and Tara Devi. The tanks referred to are not more than 3 miles from Simla in a S. direction. On the 20th August 1911, I procured a specimen (a young female) in this locality and could have shot several more. I have no doubt that they breed in the neighbourhood and I hope to take the eggs next year.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

It seems curious that Hume makes no mention of this bird being found so close to Simla, and if it had occurred here in his time, it is hardly possible that it would have escaped his notice. What seems very probable is that it is only within very recent times that this species has extended its range so high up.

Stoliczka, in his "Ornithological observations in the Sutlej Valley" (J. A. S. B., Vol. XXXVII, pt. ii, p. 16), says that this kite is only an occasional visitant to the lower hills; he observed it between Suket and Mandi on marshy ground, but not further in the interior. He adds that it is sometimes seen in the Kashmir Valley above Srinugger.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, 23rd *October* 1911.

No. XX.—THE PAINTED SNIPE (*ROSTRATULA CAPENSIS*).

I see that in your publication of 20th May 1911, under the title of Game Birds of India, Burma and Ceylon, you say that "there is, I think, little doubt * * * that the female Painted Snipe is polyandrous."

This agrees entirely with what I noticed this year at the end of May, round a large tank in the Central Provinces.

On 25th May 1911 I noticed several Painted Snipe get up from a patch of lilies by the edge of the tank. I then put two off their nests, both of which I shot and which proved to be males. Each nest contained four eggs and incubation had started; it is however worth noting that the lily patch where one would invariably flush the birds was quite close to the strip of ground where the two nests were found; so the females were always near at hand. Later in the day I found a nest with one egg in it on a small island in the tank. It also was very curious that the birds when disturbed simply flew backwards and forwards between this place and the lily patch. In all I counted 16, and out of them I shot 9; 5 of these were males and 4 females; there were however no more females, as the difference in sexes is very noticeable when on the wing. All the birds I shot were old ones. The nest in each case was in a hollow made by the hoof of some animal: in only one instance had a few dry rushes been made use of as a lining.

In all cases the nests were on dry ground among broken reeds and close to water. Length of eggs: just under 1·49″; beautifully marked and *very* glossy. In December 1910, I noticed some Painted Snipe near a small tank. I did not realize at the time that they were probably breeding and always saw 3. On the 19th I shot all three and after that saw no more; they proved to be two old males and one old female.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

In Peshawar, where they are rare, I shot a male inSeptember 1910, and in January 1910 one of the Majors in my Regiment shot a male when out after Snipe on a big Jheel; both old ones.

C. R. S. PITMAN, 2ND LIEUT.,
27th Punjabis.

ALIPORE, *August* 1911.

No. XXI.—PAINTED SNIPE *(ROSTRATULA CAPENSIS)* IN LARGE NUMBERS.

In connection with the article on the Painted Snipe in Vol. XX, No. 4, of the Society's Journal, it may interest you to know that while shooting over rice-fields near Thana on Sunday last I put up fifteen Painters in a single field, and in the course of the morning saw between fifteen and twenty couple of these birds. When shooting in the same locality I have often found Painters in greater numbers than pucca snipe, and this was the case again on Sunday when my bag included 11½ couple of Painters, 7 couple of Snipe and two couple of Jack.

These experiences hardly agree with the statement in the Journal that "nowhere is the Painted Snipe ever found in such vast numbers as is the Common Snipe," and it may be that other local *shikarees* have found the same to be the case.

On page 905 of the same Volume it is stated that "the Jack Snipe is not nearly so common as either the Pintail or Fantail," whereas when shooting at various places on this side of the Ghats, I have always found the Jack to be more common than the Pintail.

Bags made in the locality of Bombay are rarely enough to justify their inclusion in sporting records, but they are not without interest, as the comparative numbers and distribution of the different varieties of Snipe do not agree, in my small experience, with those given in the Journal.

A. H. KINGSTON.

BOMBAY, 31*st October* 1911.

No. XXII.—RECORD OF SNIPE SHOT AT HMINELONGYEE, IN THE CHIENGMAI DISTRICT OF SIAM, 18·15 NORTH LAT., 98° EAST LONG., FROM 1905 TO 1910.

I enclose a record of snipe shot in Hminelongyee, a district in Siam, and about 25 miles across the border from Burmah, 18·15 North Lat., 98° Long., for a period of six years, which may be of interest.

The months of May, June and July did not produce much. October, November and December show small bags; this was not due to the scarcity of snipe, but rather to the want of time to shoot them.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I regret that no record was kept of the different species.

Month.	1905.	1906.	1907.	1908.	1909.	1910.	Total.
January	9	31	62	43	4	92	241
February	52	9	6	53	17	69	206
March	24	21	63	32	16	7	163
April	15	39	9	24	14	16	117
May	1	..	..	..	..	..	1
June..	..	..	..	..	..	..	..
July	..	..	..	..	..	..	..
August..	37	..	44	42	14	12	149
September	48	2	64	61	..	179	354
October	49	..	..	..	13	20	82
November	2	..	..	..	..	..	2
ecember	4	..	..	21	..	19	44
Total ..	241	102	248	276	78	414	1,359

D. L. KEDDIE.

MONG PAI, PAPUN, BURMA,
9th September 1911.

No. XXIII.—NOTES ON SOME OF THE BIRD LIFE AT THANDOUNG.

The small hill-station of Thandoung has only lately come to the fore as a sanitorium for Europeans. It is situated on the Karen Hill, 28 miles east of Tounghoo, the elevation being about 4,000 feet. The country is very hilly and densely wooded, making it a difficult matter to collect bird specimens, but from an ornithological point of view it is very interesting, bird-life being plentiful and varied, notwithstanding the fact that running water is scarce in the neighbourhood, probably due to the great deforestation by Taung-yah cutters in former years, very little of the virgin forest being left.

Within recent years the Forest Department have put a large area under reservation, the immediate consequence being that a dense secondary growth chiefly consisting of a thin spikeless variety of bamboo, has sprung up.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This bamboo has an aggravating habit of throwing out its stems at all angles, and they so intertwine one with another and bend over so close to the ground that, except where paths have been cut, the greater part of the forest is almost impenetrable except on one's hands and knees.

My visit to Thandoung extended from the 1st to end of April, and I was fortunate in meeting a congenial companion, the Hon'ble Mr. Justice Robinson, an enthusiastic egg-collector. I have since repented that from the commencement of my visit I did not also take up egg-collecting. The following is a list of birds noticed and procured—a very meagre list I am afraid—but I was much handicapped by the thickness of the forest, and I can only hope that my list may be much added to by those interested in birds who may pay Thandoung a visit :—

4. *Corvus macrorhynchus*—The Jungle Crow.

8. *Corvus insolens*—The Burmese House Crow.—Noticed only round dwellings and camping grounds.

14. *Cissa chinensis*—The Green Magpie.—This bird was far from rare, but its raucous call was far oftener heard than the bird was seen; it is a great skulker and very wary. Robinson shot for me the only specimen I obtained. Karens brought me 2 well-grown nestlings on April 29th, which reared and they became very tame.

16. *Dendrocitta rufa*—The Indian Tree-pie.

18. *Dendrocitta himalayensis*—The Himalayan Tree-pie.—Both these birds were represented at Thandoung. The day before I left, I noticed a pair of the latter which appeared to be nesting, but I had not time to make a hunt for the nest.

41. *Machlolophus spilonotus*—The Black-spotted Yellow Tit.—This was a very common little bird at Thandoung. I noticed a large party in the middle of April which appeared to be a family party.

64. *Dryonastes chinensis*—The Black-throated Laughing-Thrush.—I did not procure this species at Thandoung itself, but Karens brought me a specimen from the lower hills, an elevation of about 2,500 feet.

70. *Garrulax belangeri*—Burmese White-crested Laughing-Thrush.—This bird was not very common on the top of the hill, much more plentiful lower down the Ghaut.

72. *Garrulax pectoralis*—The Black-gorgeted Laughing-Thrush.—Almost as common at Thandoung as elsewhere, but rather local. I saw well grown young birds just able to fly on April 23rd and so they must have commenced nesting rather exceptionally early.

86*a*. *Trochalopterum ramsayi*—I only found this bird on two occasions and each time they were solitary, no other birds of their species being near. I shot both birds seen and expected them to be females with a nest, but they both turned out to be males. *T. ramsayi* has a very pretty

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

whistling note, and it was this which betrayed its presence to me in very thick brushwood.

117. *Pomatorhinus nuchalis*—Tweeddale's Scimitar Babbler.—This bird was not often observed, but it may have been more common than appeared. As being such a great skulker, it was difficult to find in the dense undergrowth. Robinson obtained its nest with fresh eggs about the middle of April and shot the parent bird which he presented to me, being the only specimen I obtained.

129*a*. *Pomatorhinus imberbis*—A very common bird at Thandoung. Its noisy call was to be heard in every thicket. Common as it was, neither Robinson nor myself managed to find its nest. Two specimens shot.

145. *Pellorneum subochraceum*—Burmese Spotted Babbler.—I only saw one bird of this species which I secured. I would probably have seen more had I not been handicapped by the thickness of the jungle. Karens brought 3 eggs on April 29th which Major Harrington identified as belonging to this species.

186. *Turdinulus roberti*—Robert's Babbler.—As such I identified my specimen, but Major Harington, to whom I sent it, thinks it is *Turdinulus davisoni*, but he is sending the skin home to have the identification verified.

187. *Myiophoneus temmincki*—The Himalayan Whistling-Thrush, or

188. The Burmese Whistling-Thrush.—One or other of these birds I noticed, but as I was unable to procure a specimen, I cannot say which.

190. *Larvivora cyanea*—The Siberian Blue Chat.—A specimen was brought to me from the lower hills where it had been snared by Karens with bird-lime.

218. *Staphidia striata*—Tickell's Staphidia.—Both Mr. Robinson and myself found nests of this bird. I found 7, but it was some time before we could make sure of the identification of the eggs. Eventually Robinson shot the parent bird off the nest, and I caught a bird on its nest. Prior to this I had not noticed the staphidia, and it is a bird which can be easily overlooked, its habits resemble those of Tits or White eyes—hunting in parties amongst the leaves and boughs of forest trees and keeping up a continual twittering the while. After having once observed the bird, I found it to be quite common. I have already described the nest and eggs of this bird in the Journal. The birds seem to breed chiefly in April and several nests were to be found along every road with suitable bands. I found all my nests between the 18th and 30th of April, and all contained fresh eggs. One completed nest I found on the 23rd and by the 30th the full clutch which appears to be 3 only was laid. None of the nests found contained more than 3 eggs.

228. *Zosterops simplex*—Swinhoe's White-eye.—A common little bird. There may be other species of White-eye at Thandoung but such small birds were difficult to see in the thick forest.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

249. *Chloropsis hardwickii*—The orange-breasted Chlropsis.—I only procured one specimen of this bird, the only one seen.

270. *Hypsipetes concolor*—Burmese Black Bulbul.—A common bird. It appeared to be nesting in April but I could find no nests.

280. *Molpastes nigripileus*—The Tenasserim Red-vented Bulbul.—This bird was observed on several occasions but at Thandoung itself it was by no means very plentiful.

287. *Xanthixus flavescens*—Blyth's Bulbul.—An extremely common bird. This bird and the next being the commonest birds in the settlement. I expected to find quite a number of nests. I found many old nests which I think belonged to this species but only one with eggs.

288. *Otocompsa emeria*—The Bengal Red-whiskered Bulbul.—As common as Blyth's bulbul, but I only found 2 nests with eggs. The last nest I found containing one egg only on the 26th of April, but before I left on the 30th the full clutch of 3 was laid.

325. *Sitta frontalis*—The Velvet-fronted Blue Nuthatch.—Common.

339. *Bhringa remifer*—The Lesser Racket-tailed Drongo. A nest I found on April 29th, containing 3 fledgings almost ready to leave the nest, I think belonged to this species. The nest was built in the fork of a dead bamboo which had been partially broken and was hanging over from midway up the stem.

340. *Dissemurus paradiseus*—The Larger Racket-tailed Drongo.—Common. Robinson found a nest containing hard set eggs on about April 18th as far as I can remember.

423. *Acanthopneuste plumbeitarsus*—Middendorff's Willow-Warbler.—A specimen of this bird was brought me by Karens from the lower hills at an elevation of about 2,500 feet. I noticed on several occasions larger parties of a small warbler, hunting about in the brush-wood which I believed to belong to this species, but the undergrowth was so dense that I did not manage to procure a specimen.

430. *Acanthopneuste davisoni*—The Tenasserim White-tailed Willow-Warbler.—I only procured one specimen of this bird and that was a parent bird from its nest on the 19th of April. The nest contained 3 pure white top-shaped eggs measuring ·47 by ·55. The nest was globular in shape, slightly oblong with the entrance on the side. The nest was beautifully concealed, being surrounded by leaves and grasses used in its construction, and had I not noticed the bird flying off I would not have discovered the nest.

461. *Suya superciliaris*—Anderson's Hill Warbler.—This was the only Suya I noticed, it frequented the grassy knolls. I procured one nest containing 4 fresh eggs on the 25th of April. The nest was purse-shaped and built between the stems of a small bush close to the ground and lined with fine grass. The eggs were a dull greenish white in colour with minute

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

brown specks sparingly distributed over the egg except at the larger end at the top of which they formed a zone. They measured ·6 × ·49.

486. *Tephrodornis pelvicus*—Nepal Wood-Shrike.—One specimen obtained, several others seen.

491. *Pericrocotus fraterculus*—Burmese Scarlet Minivet.—Only one specimen of this beautiful bird obtained, other birds were seen but on rare occasions.

539. Mynas and Starlings.—The White-winged Myna.—I have no notes of any seen except that I noticed a bird which I took to be *Sturma nemoricola*.

562. *Siphia albicilla*—The Eastern Red-breasted Flycatcher.—Seen on several occasions and I obtained 2 specimens, a male and female.

569. *Cyornis melanoleucus*—The Little Pied Flycatcher.—Only once seen and obtained.

575. *Cyornis rubeculoides*—The Blue-throated Flycatcher.—Only saw one bird which I procured.

579. *Stoparola melanops*—The Verditer's Fly-catcher.—This bird was nesting in April in the banks of road cuttings and Robinson and I found many nests. I took a clutch of 4, one of 3 and an egg from a clutch of 4 between 25th and 30th. The nests were built of moss and lined with fern stems and with 2 exceptions were built into crevices in the banks. The exceptions were 2 nests I found placed about 18″ down a small tunneled hole, just large enough for the bird to enter by, reminding one of a Bee-eater's nest-holes, by which bird it had probably been originally made.

592. *Culicicapa ceylonensis*—The Grey-headed Flycatcher.—One specimen obtained. Only noticed 2 or 3 times.

601. *Hypothymis azurea*—The Indian Black-naped Flycatcher.—One specimen brought to me by Karens from lower hills.

604. *Rhipidura albifrontata*—The White-browed Fantail Flycatcher.

605. *R. albicollis*—The White-throated Fantail Flycatcher.—Both species were represented at Thandoung, the latter being quite common. I found a nest belonging to the latter bird on the 21st of April, containing 3 young birds. The nest was cone-shaped and beautifully, neatly and compactly constructed being plastered all over with cobwebs and lined with very fine grass. It was built in the fork of a dry slender bamboo branch which was partially broken midway up and hanging suspended from lower stem.

608. *Pratincola caprata*—Common Pied Bush-Chat.—I noticed 2 or 3 pairs round the Hotel. They were apparently breeding, but I found no nests.

634. *Henicurus leschenaulti*—Leschenault's Forktail.—I had very bad luck in not being able to procure this bird's eggs. On two successive days I noticed a pair of birds in a little wooded swamp which I made cer-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tain had a nest but I could not find it. Eventually as I wanted a specimen I shot one of them, which proved to be the female. In her ovident I found an unformed egg. Shortly after shooting the bird I found the nest nearly completed. It was built into a mossy bank and the exterior of the nest being composed of moss it was difficult to distinguish from its surroundings. It was lined with fine grass and fern stems.

680. *Merula obscura*—The Dark Ouzel.—Only one specimen obtained by Robinson.

690. *Petrophila erythogastra*—The Chestnut-bellied Rock Thrush.—A solitary bird seen on several occasions round the Hotel at the beginning of April, and now I come to think of it, it had probably a nest near by but at that time I had unfortunately not begun to look for nests.

706. *Cochoa purpurea*—The Purple Thrush.—Only one specimen seen, which was procured.

726. *Munia atricapilla*—The Chestnut-bellied Munia.—Saw a party of munias I took to belong to this species, beside a swampy stream.

735. *Uroloncha punctulata*—The Spotted Munia—Common, and found many old nests but no new ones in April. They probably nest later on in the rains.

761. *Carpodacus erythrinus*—The Common Rose-Finch.—One specimen brought to me from the lower hills.

801. *Emberiza rutila*—The Chestnut Bunting.—One specimen obtained at beginning of April.

841. *Anthus maculatus*—The Indian Tree-Pipit.—Seen everywhere along the roads. Only one specimen obtained.

907. *Arachnothera aurata*—The Smaller Streaked Spider-hunter.—One specimen obtained.

909. *A. longirostris*—The Little Spider-hunter.—Seen on several occasions.

Flower-peckers.—The twittering of these little birds I frequently heard, but owing to the density of the forest it was very difficult to observe such small birds and I did not shoot any.

955. *Chrysophlegma flavinucha*—The Large Yellow-naped Woodpecker.—This is the only species of the larger Woodpeckers I obtained. All the large species were conspicuously uncommon and very wary, also the density of the forest was a great hindrance in following up the birds.

968. *Dendrocopus atratus*—The Stripe-breasted Pied Woodpecker.—Common. I obtained two specimens, a male and a female.

975. *Iyngipicus canicapillus*—The Burmese Pigmy Woodpecker.—Common ; a male and a female obtained.

1012. *Cyanops asiatica*—The Blue-throated Barbet.—I did not see this species at Thandoung itself, but a specimen was brought to me from the lower hills.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1018. *Cyanops ramsayi*—Ramsay's Golden-throated Barbet.—Very common indeed, and its aggravating monotonous call was to be heard everywhere.

1027. *Merops phillippinus*—The Blue-tailed Bee-eater.—These birds seem to breed early at Thandoung. I dug into two nests in the banks of roads during middle of April, one contained very hard set eggs and the other young birds, and I did not wish to disturb any more nesting holes on the chance of finding fresh eggs. I was glad to see that the parent of the young birds in the hole I dug into continued to tend her young and by the time I left, the nestlings were flourishing and nearly ready to leave the nest, although lying quite exposed.

1031. *Nyctiornis athertoni*—The Blue-bearded Bee-eater.—I am almost sure I saw this bird on one occasion in heavy forest, but did not manage to secure it.

1051. *Dichoceros bicornis*—The Great Hornbill.—Seen occasionally at Thandoung, but commoner a little lower down the hills.

1067. *Upupa indica*—The Indian Hoopoe.—Saw several, and one bird flying with a grub in its mouth and apparently on its way to nest.

1101. *Harpactes erythrocephalus*—The Red-headed Trogon.—Seen on several occasions.

1123. *Rhopodytes tristis*—The Large Green-billed Malkoha.—One specimen shot ; not very common at Thandoung.

Paraquets were so scarce that I do not remember noticing any, but a specimen of the Indian Loriquet, *Loriculus vernalis*, was brought to me from the lower hills.

Owls and Nightjars.—None seen or heard.

1209. *Lophotriorchis kieneri*—The Rufous-bellied Hawk-Eagle.—I have already recorded in the Journal the obtaining of this species at Thandoung. I believe this bird has not hitherto been obtained in Burma Proper. I shot it in heavy forest in the act of carrying off a green pigeon.

1251. *Baza lophotes*—The Black-crested Baza.—I noticed a Black-backed Hawk-Eagle flying through the forest on one occasion which I am pretty confident was above species, but it was too wary to let me approach within shooting range.

On the summit of a hill known as Thandoung Gyi, I shot a falcon which I believe was the Shahin Falcon, *Falco peregrinator*, but it fell down the hillside into heavy forest, in which I was unable to find it.

1282. *Sphenocercus apiccauda*—The Pin-tailed Green Pigeon.—Fairly common, but I did not manage to shoot any birds, the commonest Green Pigeon, of which I shot several, was the Kokla Green Pigeon, *Spehnocercus sphenurus*.

1287. *Ducula griseicapilla*.—The Grey-headed Imperial Pigeon.—Fairly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

common but very wary. I did not succeed in shooting any myself, but one of the visitors at the Hotel shot one.

1291. *Chalcophaps indica*—The Bronze-winged Dove.—Once seen and shot, but could not be found in the thick forest into which it had fallen.

1311. *Œnopopelia tranquebarica*—The Red Turtle-Dove.—Occasionally seen on the roads. Two shot.

1312. *Macropygia tusalia*—The Bar-tailed Cuckoo-Dove.—Quite common. Robinson took one clutch of eggs if not more and he and I found a nest in the making, which was however deserted later on. This bird builds the usual platform of twigs, and places its nest on overhanging bamboos.

1314. *Macropygia ruficeps*—The Little Malay Cuckoo-Dove.—Robinson took a cluch of this bird's eggs, about the middle of April as far as I can remember, and I found a nest containing one hard set egg on April 25th. The nest was very difficult to get at being placed high up on a single slender bamboo. In trying to secure the egg it got broken. The nest was composed of a very scanty collection of twigs.

1328. *Gallus ferrugineus*—The Red Jungle-fowl.—Very common, feeding on the roads in the early morning and evening. Jungle Fowl and Pheasants should afford quite good shooting in Thandoung during the open season. When I was there it was the close season and except for shooting two pheasant for identification purposes I desisted from shooting Game Fowl although I had many opportunities. I heard Hill-Partridges once, but did not manage to secure a specimen, so cannot tell to what species they belonged to, probably Blyth's Hill-Partridge, *Arboricola rufigularis*

1374. *Francolinus chinensis*—The Eastern or Chinese Francolin.—Heard on several occasions in the grassy portions of the country.

The neighbourhood of Thandoung presented no opportunities for the collection of Water Birds and I wish I had been able to make an expedition along the larger streams when I expect some interesting varieties of birds might be obtained.

J. P. COOK.

THAYETUNG, *25th September* 1911.

No. XXIV.—MIGRATION OF BAYA (*PLOCEUS BAYA*).

As the forests of my Division are remarkably dry, Forest-fires are of more serious consequences than any other injury by natural causes. Of the many reasons, that lead to these fires, the Weaver-bird's nest (*Ploceus baya*) is one that keeps the staff employed in fire protection work, anxious all through the fire-season. Either from burning fire-lines or from fires that occur in adjacent unprotected areas, these nests after catching fire are wafted like baloons in the air, and thrown into the protected portion

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

causing serious damage and disappointment. In nearly five cases out of a hundred, the Baya was found to be the criminal. And to minimize the cases of annual fires, I had arranged to pick up as far as possible all Baya's nests in dangerous places, before the commencement of the fire-season. Accordingly all the staff concerned was carefully watching to find out as to where and when the nests would be prepared. But since the monsoons failed or were unusually late in these parts, grass was not ever available for the Weaver-bird to weave its nest at the proper time. It seems to have made unsuccessful attempts in several localities, where green grass of some kind or other was available, and relics in the shape of a bunch or two of grass are found attached to the ends of the branches of trees. During last month, as I went out in tour of inspection, a couple of my Forest-guards, relying upon these relics informed me that the Baya had begun weaving the nest just then, and in about two weeks' time the architecture would be complete. But as contrary evidence, the cultivators of Jawar assured me that they did not see a single Weaver-bird, and rightly remarked that, as it did not get suitable green grass in time to prepare its nests, it must have migrated to that part of the country, which could supply it with the necessary building material. After inspection of some places, where hundreds of these fresh nests used to be found every year, I came to the conclusion that the Weaver-bird really migrated to some distant part of the country. I think observers in other parts of India and Burma, where there was no change in the monsoons, or where in the absence of timely rains, some other kind of weaving material is available, may be able to corroborate my conclusions, perhaps noticing an unusually increased number of nests this year.

A. B. PUNDE,
Divisional Forest Officer.

GAROTH (INDORE STATE), 26*th December* 1911.

No. XXV.—THE MAROON ORIOLE (*ORIOLUS TRAILLII*).

I write to ask if any member will be so kind as to enlighten me on a question of plumage of *O. traillii*, the Maroon Oriole, which in this part of the district is, to my mind, the commonest form of Oriole found. Of the numbers that have lately passed through my hands all those in the full maroon plumage have been males, all in the duller streaked and dark brown plumage females, not young. I write only concerning adults.

The Nepalis to whom the bird is well known, distinguish two sexes by this plumage and my collector at present, an old Pahariah, pointed this out to me and had always asked me to sex birds of this species carefully myself and I must say that so far his assertion has been perfectly correct; at the same time I do not for a moment wish to dispute that the plumage

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of the young of both sexes will resemble the plumage of the female. The note of this bird, I may add, much resembles that of *O. melanocephalus* as does it also in habits except that it keeps more to the heavier jungle.

The Nepali name for the bird is 'Singanee,' literally translated "one who blows her nose."

ALEX M. PRIMROSE.

LONGVIEW T. E., PUNKABARI, P. O.,
D. H. Ry., 16*th November* 1911.

No. XXVI.—WOOD SNIPE (*GALLINAGO NEMORICOLA*) OCCURRING NEAR BANGALORE.

I am sending you a snipe I shot not far from this on the 14th instant. On comparing it with the plates issued with Vol. XX, No. 2, I cannot help thinking it is The Wood Snipe (*G. nemoricola*), as it is too dark in colouring for the Eastern Solitary Snipe (*G. solitaria*).

The record of shooting the bird under reference is as follows :—

I was out snipe-shooting on the 14th instant with Captain W. B. Roberts of the 101st Grenadiers. The country was hilly and covered with scrub jungle, one would not have been surprised to have put up a panther. A lot of paddy fields were scattered about. Besides these there were patches of moist ground, where water had found its way through the bunds of various tanks. We had shot a certain number of Pintail snipe (*G. stenura*) and had just moved on to a patch of water densely covered with matted grass. The grass had been trodden down by cattle, else it would have stood to some height. The snipe, under reference, got up right under Capt. Roberts' feet, in fact he almost trod on it. He was unable to shoot, as it flew along the line of beaters and broke back. On first viewing it, I thought it was a "Painter," but I very soon recognized by its size, dark colour and flight that it was not. Its flight was heavy and slow. Neither Capt. Roberts nor myself heard it utter a sound. I shot it at a distance of about 25 to 30 yards. It is a male. Almost at the same moment as I shot, a florican got up within 20 to 30 yards of where the snipe had lain. It was also brought to bag.

Will you kindly let me know whether I have identified the bird correctly. The skin has not been very well cured. I would suggest its being seen to, as it is a *rara avis*.

If you will send me a form about snipe shooting, I will fill it up and send you my record at the end of the season.

R. M. BETHAM, LIEUT.-COL.,
The 101st Grenadiers.

BANGALORE, 16*th December* 1911.

[The specimen sent is undoubtedly a Wood Snipe (*G. nemoricola*). On page 1155 of Vol. XX of this Journal, the occurrence of the Great Snipe (*G. major*) near Bangalore was also recorded.—EDS.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXVII.—GOOSE-SHOOTING IN CUTCH.

NOTES BY MAHARAJ KUMAR SHRI VIJAYARAJJI.

In Cutch, goose-shooting is to be had at only one place. This place is on the Runn of Cutch between the Bunni Peninsula and the mainland, N.-W. of Bhuj. Some two or three monsoon streams empty themselves into the Runn near by and in a good year the water collects in a slight depression some two or three miles long by half a mile wide.

Geese have rarely been seen on tanks on the mainland, and then never more than from five to ten in a flock. Bar-headed geese are known in this country, but they are rare. The grey-lag come by thousands to the place mentioned above. They are very difficult to get at, and until fairly recent years no easy way of shooting them was discovered. They, or rather most of them, very early in the morning, long before-day break, leave the marsh which the natives call the Dhandh, to feed on gravel near the mainland some two or three miles off. From the Dhandh they go out in several directions and the shikaris have only got to find out in what places they settle down to pick up the gravel and to sun themselves. Then in the dark before dawn the sportsmen have to take their places just short of the place where the geese settle.

These birds are so curiously particular as to their course of flight that for the convenience of the sportsmen pits are dug in the flat plain of the Runn for them to sit in. A hurdle is slightly raised on the side of the pit facing the Dhandh. Three or four guns can conveniently take their places at distances of, say, from one to three hundred yards between each gun, in a long line before the geese begin their daily flight. The hurdles are made of the same kind of vegetation as grows all round the spot, *viz.*, the laana (*Suæda* sp.) so they do not seem to catch the eyes of the birds till the sportsman behind them stirs to take his aim.

The geese begin their flight very punctually and regularly. Before you can see clearly in the faint glimmer of dawn, they send out some scouts to see whether the ground is quite clear of an enemy or not. These scouts fly fairly quietly, and as they come when it is still pretty dark, they at times pass out of range without being noticed. As the light begins to grow stronger in the East, the sportsmen's eyes get fixed towards the long dim black line of the horizon which lies stretched out flat and monotonous for miles across one's front. Far away in the distance, you see a flight of birds low down over the horizon in a meagre line advancing steadily towards you; and as they draw close, you can see their wings flapping pretty fast, and can hear them, making the familiar noise—krouk-krouk—so dear to a sportsman who has once before had this experience.

Now begins the proper shooting. The East is glowing, the sky is turning from darkness to blue, the great flat black expanse in front is revealing

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

itself as flat brown soil thickly sprinkled with the heather-like laana. The noise of the birds awaking far off on the Dhandh is borne more and more loudly to our ears, and meanwhile the geese are coming up in small groups at first with long pauses between. They come in line or in inverted Vs,—krouck-krouck.—Soon it is a case of larger flights; battalion after battalion advances upon the line occupied by the sportsmen; and the guns are getting busy. Now here, now there, a big mass leaves the line and comes thumping down to the earth or else a wounded one is seen gradually to sink below the line of his fellows, and come to ground slowly several hundred yards away. They are either very plucky or very foolish birds. One is rather inclined to think the latter, because true to the course of their flight, they keep on coming by hundreds, heedless of the firing in front of them. If any of the sportsmen find that their direction is changing, early in or in the middle of the shoot, he can easily move his hurdle, place it across the new line of flight, kneel down behind it and recommence.

The proper shooting lasts for about an hour, but it is quite worth the while of the sportsman to wait behind his hurdle for three hours, because there have been many instances of the geese coming from the Dhandh after the shikaris have been called to pick up the dead birds. A gun which happens to be in a good place may fire 70 cartridges any morning; and at the beginning of the shooting, you get some easy shots because the geese fly fairly low and slowly as they approach their feeding ground. Later on when a good deal of firing is going on, they come fairly high and fast, but by no means out of (vertical) range.

There are generally three or four different places which the geese visit in the morning and one can do the shooting at each place in turn on consecutive days. But they do not seem to mind even if you shoot in the one place for three days running. Whether different birds go out to sun themselves each morning or whether the same ones go to the same places it is difficult to say; but the sportsman gets more or less the same amount of shooting for three days in the one place. If four decent shots shoot for three days they can easily get 300 geese. BB shot is advisable; as is also an aim well in advance for their flight is much speedier than it looks; and they can carry much shot, if not hit in the head or neck. It is interesting to take a canoe and paddle out on to the Dhandh later in the day. Crowds of big kurunj will go wheeling off into the sky: huge flocks of big flamingoes will stand at attention as you come into view round some mass of long reeds, and then go running, scuttering and flapping away, long lines of pink against the blue sky with a roar like a fast train rattling over a railway bridge. Ducks paddle about in the long reaches, but are whirring off before you can get near: and the droves of geese are more easily heard than seen. It is a strange republic.

VIJAYARAJJI.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXVIII.—FALCONS AND THEIR PREY.

In a recent number of the journal I noted an attack by a falcon on the gulls in Aden harbour; last week I witnessed another determined and successful attack by the falcon, the victim on this occasion being one of the smaller terns; the falcon struck her prey down to the water and must have killed it at once as I never saw it move afterwards. The gulls and terns united in mobbing the falcon but she picked her quarry from the water at about the third attempt and forced her way out through the crowd finally soaring high above them to the land. It was interesting to see the way in which the falcon disposed of the dead tern so as to make it easier to carry. When she first picked it from the water it hung by one wing from her talons but I could see from my boat that she was as it were rolling the bird up and finally she made a small neat package between her feet. There is only one pair of these birds in Aden and I am collecting evidence which I think points to the fact that they breed here, somewhere in the cliffs on the south side of the Shum Shum range near the Artillery lines.

The ospreys on Round Island have built another nest making three in all on the top of the island. I hope to be able to report the eggs in my next note.

S. E. PRALL, Lt.-Col., I.M.S.

Aden, *7th January* 1912.

No. XXIX.—ON THE OCCURRENCE OF THE COMMON WOOD SHRIKE (*TEPHRODORNIS PONDICERIANUS*) AND THE CENTRAL ASIAN BLACK BIRD (*MERULA MAXIMA*), NEAR PESHAWAR.

It may be of interest to record the occurrence of the following locally rare species in Peshawar, *viz*:—

(*a*) The Common Wood Shrike (*Tephrodornis pondicerianus*).

(*b*) The Central Asian Black bird (*Merula maxima*).

(*a*) I met with, when out shooting on the 4th November in a wooded nullah at the foot of the Cherat Hills due south of Peshawar. There were at least two or three of these birds moving about from tree to tree. They were very tame, one individual allowing me to approach within 15 or 20 feet. This bird uttered a pretty note of three or four syllables which unfortunately I did not record at the time. The supercilium was buffish white. This was the only occasion on which I observed this Shrike, although I visited the locality several times subsequently.

(*b*) Was shot on the artillery jheel within two miles of Peshawar. It flew up out of a deep drain and settled in a tree uttering a note of anger or alarm not unlike that of the Missel thrush, at the same time vigorously

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

flirting its tail. It was a fine big male over 11 inches in length with a wing measurement of 5·9 inches, and was probably a bird of the year as some of the feathers of the upper tail coverts were bordered with brownish buff. The irides were very dark brown, the bill was horny brown, only the base of the lower mandible and the gape showing yellow.

It is not improbable that this black bird regularly visits Peshawar in winter, as a friend here, who is a good observer of birds, assures me that last cold weather he saw what he described as an "English black bird" in the middle of cantonments.

Within Indian limits this is, as far as I know, the first record of the occurrence of *M. maxima* in the plains. Hitherto it has only been observed at considerable altitudes in the Himalayas.

H. A. F. MAGRATH,
51st Sikhs, F. F.

PESHAWAR, 26*th December* 1911.

No. XXX.—HABITS, FOOD AND NESTING OF THE GREAT HIMALAYAN BARBET (*MEGALÆMA MARSHALLORUM*).

This gaudily coloured Barbet, the largest of its tribe, is a tolerably common denizen of the forests in and around Simla, and is a permanent resident. It is usually to be seen singly, but sometimes in small parties, and during the winter months in large flocks of thirty to forty at a time.

It generally affects high trees, but is frequently to be seen feeding on low ones, and also on small bushes. I have never yet observed it on the ground.

It has a strong and rapid woodpecker-like flight in immense undulations. Having taken up its position on a prominent tree at the top of a hill, it drops, if alarmed or startled, with the velocity of an arrow into the ravine below. It is not particularly shy, and will allow one occasionally to approach quite close to it. I have frequently shot two birds, one after another, from the same tree. The great difficulty, however, is to catch a glimpse of it. For in spite of its gaudy feathers, its plumage blends wonderfully with the foliage of the trees, and it invariably selects the topmost branches on which it sits motionless. When feeding, it is constantly on the move, and all that can be seen are the shaking leaves. I have often waited for several minutes, with strained eyes, trying to catch sight of the bird, and for fear of losing it, have blazed off into the rustling foliage, sometimes with very satisfactory results.

The peculiarity about this Barbet is, without doubt, its extraordinary call. This has been aptly likened to the syllables, "pi-o," "pi-o," "pi-o," and while giving a good idea of it, conveys only a faint impression of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

volume of sound emitted by the bird. Throughout the spring and summer months the hill-sides resound with its monotonous and wailing cries. I shall never forget the day when I first heard its notes. It was many years ago when I first came to Simla. My stay here was uncertain, and I was determined to see as much of this station as possible. On a hot and dusty morning in May, after an early breakfast, I started to explore the "Glen," one of the famous picnicing resorts of the residents here. After wandering about the hill-sides for several hours, I turned my steps homewards, but unfortunately lost my way, as the slopes were densely wooded. After making several unsuccessful attempts to find the path, I threw myself on the hill-side in sheer exhaustion, and determined, after a short rest, to make another attempt to find it. At my feet grew a small bush in full flower, and various kinds of bees were busy at work amidst them. On the opposite side, a pair of parrots had taken up their abode in a rhododendron tree, and were deeply immersed in domestic cares; while close by some Flycatchers were plying their daily vocations. The peaceful scene, combined with the cool and refreshing breeze, and the "drowsy hum of the bees" soon lulled me into dreamland. I could not have been asleep for more than a few minutes, when I was suddenly awakened by hearing a most extraordinary voice above me. It was the love call of this Barbet. I jumped up dazed and startled. The notes above me seem to increase in intensity. Two rivals in the neighbourhood began answering back, and the hill-sides were resounding and echoing with their cries. The act of my jumping up suddenly must have frightened the parrots, for uttering their alarm notes, they darted screeching across the trees. Others in the vicinity followed. A noisy flock of Jays commenced their garrulous chattering, and in the distant ravine I could hear the shrill whistles of *Myiophoneus temmincki*. For a few seconds the din and noise around me was so deafening and intense, that I confess I was not only startled, but utterly bewildered, and it was some time before I could quite recollect my senses. I had never heard the like of such sounds before, and can now only realise what must be the feelings of some unfortunate traveller when stranded alone in the depths of a Brazilian forest.

In an interesting article contributed to the columns of the "Madras Mail" of the 5th August 1911 on this bird, Mr. D. Dewar, I.C.S., rightly doubts Jerdon's statement (quoted in the "*Fauna*," Birds, Vol. III, p. 85) that this species lives *entirely* on fruit, as he thinks that such food must be scarce in the hills during the winter months. Long ago the two Marshall brothers in their excellent Monograph on the *Capitonidæ* pointed out that the diet of this Barbet consisted both of fruit *and insects*, and Hodgson, whom they quote, remarked that it devoured ants and other insects, but chiefly lived on fruit. As bearing on this subject, the following particulars which are extracted from the paper referred to above, and which relate to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the contents of the stomachs of birds killed in Nepal at various times of the year are interesting :—

February 6th..	Pulpy berries only.
April 10th, 20th, and 26th	Leaves of some odorous flower and pulpy fruits.
May 15th, 28th and 31st	Shining green coleoptera, other beetles and fruits.
October 1st	Beetles only.

I can fill in some of the gaps above from my diary :—

March 25th and 26th	Berries and petals of the rhododendron flower.
July 27th	Figs.
November, December, and January.	Large flocks of these birds are to be seen during the winter months in Simla feeding on "Medlars" which apparently constitute their chief diet at this time of the year, and which they swallow whole.

From the foregoing it is, I think, clear that these Barbets are not purely vegetarians, as was thought by Jerdon, and that when pushed for food, beetles and other insects do not come amiss to them. So long, however, as berries, etc., are to be got, it is probable that these are preferred to an insectivorous diet.

As regards the nidification of this species, it has generally been thought that the birds excavate the nesting holes themselves, but in the neighbourhood of Simla, it is by no means unusual to find these Barbets in possession of old holes made by Woodpeckers. I have notes of two such cases: in one I found young, and in the other fresh eggs. The latter, before being blown, had a pinkish appearance owing to the yolk showing through the shell.

The period of incubation in this species has not yet been ascertained, but it probably does not exceed 14 days. It would be interesting to know whether both sexes share in the labours of incubation, and in the feeding of the young. So far as my observations go, I have up to this, seen only one bird, apparently the female, either in or near its nest, but never two; what happens to the other one? Does it hang about in the vicinity, and keep uttering its extraordinary call? Owing to the wary habits of this bird when nesting for it leaves its hole at "long shot," it is most difficult to make observations.

I have found that occasionally the nesting holes are very deep. On the 29th June of this year I examined one that contained young, and though we dug it to the extent of more than two feet, we did not reach

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the bottom. The usual depth of the hole, however, seldom exceeds 12"-18". Hume says that they are only a few inches in depth.

"CARLTON GROVE," P. T. L. DODSWORTH, F.Z.S., M.B.O.U.
SIMLA, 18th November 1911.

No. XXXI.—MARBLED DUCK AT BARODA.

A bag of 78 duck made near Baroda on the 19th November included three specimens of the Marbled Duck (*Marmaronetta angustirostris*) which I had not previously met with. I shot two of these and a gadwall out of a small pack of four duck flying past. The remainder of the bag consisted mostly of pochards and gadwalls. These duck were much more grey in colour than those figured by Mr. Stuart Baker.

R. G. BURTON, LT.-COLONEL,
BARODA CAMP, 20th November 1911. 94th Russell's Infantry.

No. XXXII.—THE SOOTY TERN (*STERNA FULIGINOSA*) IN CACHAR.

The Sooty Tern is one of these essentially sea-birds which generally haunts ocean islands and is but rarely found even on the coast of an Indian continent; its appearance, therefore, so far inland as Cachar, 170 miles in a bee line from the nearest sea, is most remarkable. This specimen in question was shot by one of my collectors, Mahomed Ismail Mia, on the Silcoorie bhil on the 3rd of June this year, 1911, whilst he was engaged in shooting for me a pair of baya-birds. He was watching the baya-birds at their nests and waiting until he could select a specimen in perfect plumage, such as I required, and noticed this tern fly past. It struck him as something new to him and on its again flying past he shot it and sent it home to me. Ismail is a thoroughly reliable man who has worked for me for over twenty years and worked for Hume before then, moreover, he has not been out of Cachar and Sylhet this year so could hardly have got it anywhere else. The specimen obtained was quite a young bird in complete "sooty" plumage except for a few white feathers from the breast which shewed up over the shoulders of the wing. It was probably driven inland during the heavy gales of May and then instead of returning to the sea-coast worked its way up some of the big rivers into the Surma Valley.

E. C. STUART BAKER, F.Z.S., F.L.S.
BROADSTAIRS, 1st November 1911.

No. XXXIII.—NOTES ON THE SOUTHERN MIGRATION OF SNIPE NEAR CALCUTTA, 1911.

This year the first Snipe were shot near Calcutta during the last week of August; they had in all probability come in with the moon which was

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

full on the 8th September. On the third of September one gun obtained over 20 couple. On 10th I was out with a friend and we only got 16 couple between us. This was at a place about seven miles north of the famous Kanchrapara Jheel; the day was wet and cold, and also there was a strong wind blowing all the time. These two bags were entirely composed of Pintail.

I did not shoot again that month, but heard of some quite nice bags from those jheels. As far as I could discover they all were Pintail. I visited the same jheel on the 15th October, just a week after the full moon. I was alone and got 10 couple of Pintail and 2 couple of Fantail, also 2 brace of Golden Plover. There were 4 other parties on the same jheel that day and their bags were as follows:—

2 Guns	..	..	.. 10 couple.
4 Guns	..	..	.. 24 couple.
3 Guns	..	..	.. 24 couple.
2 Guns	..	..	.. 12 couple.

I examined these bags and found practically no Fantail among them. I shot nearly all my birds at midday in the shade of trees and bushes at the edge of the paddy fields.

I have not been out myself this month, but I have heard that all the old spots are now empty, and that nearly all the birds shot are Fantail. These presumably came in with the moon which was full on the 8th of November.

I have not heard of any large bags this year; in fact, most of them seemed to be remarkably small for this part of the country.

There are, however, thousands of birds exposed daily for sale in the Calcutta Market all of which are sent in from places in the neighbourhood. Unfortunately I shall not be here when the Snipe migrate north again. Personally I can see no difference between the flight or cry of these two varieties of Snipe.

C. R. S. PITMAN,
27th Punjabis.

ALIPORE, CALCUTTA, 14*th November* 1911.

No. XXXIV.—OCCURRENCE OF THE NUKHTA OR COMB-DUCK (*SARCIDIORNIS MELANONOTA*) IN SIND.

It may be of interest to record the occurrence of the Nukhta (*Sarcidiornis melanonota*) in Sind. A couple were shot at Khahi Dhand, Sujawal, Karachi District, on December 27th, 1911, a male by Mr. S. R. Arthur, I.C.S., and a female by myself. A flight of six was also observed on the same day by several members of the party. The local fishermen appeared to be acquainted with the bird, which they called "hanj," the ordinary

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

word for a goose, distinguishing it from the Grey Lag, which they called "Lalu Hanj"; the distinction suggests that the Nukhta is the commoner of the two at this dhand. Two years ago at the same dhand I saw a number of birds which I now believe to have been Nukhta, though at the time I could not identify them as I failed to shoot a specimen.

HYDERABAD, SIND, M. WEBB, I.C.S.
January 5th, 1912.

[The Society has just received the skin of a female Nukhta from Mr. R. L. McCulloch, who shot the bird near Sujawal, Sind, on the 12th February 1912. Mr McCulloch writes that the Sindhi name for this duck appears to be "Káro hānjh" (=Black goose).—EDS.]

No. XXXV.—THE BREEDING OF THE FALSE HIMALAYAN VIPER *(PSAMMODYNASTES PULVERULENTUS)*.

In my article on this Snake in the Popular Series appearing in this Journal (Vol. XX, p 73), I could mention but little of the breeding. Two gravid females lately received from Shillong, both killed in August, throw further light on the subject. One measured 1 foot 10 inches and contained three fœtus (1 ♂, 1 ♀, and 1 ?), the largest of which measured $6\frac{1}{16}$ inches. I captured a hatchling in Rangoon only $4\frac{3}{4}$ inches long, so that the length of the young at birth is very variable. The second specimen measured 1 foot $6\frac{7}{8}$ inches, and contained 4 embryos (2 ♂, 2 ♀). These were nearly the same length as in the last. I noticed that the ♂ claspers are bifid. In both cases the development of the young left no doubt that they would very shortly have been born. The fact that my hatchling in Rangoon was captured in June shows that the breeding season in the Hills is later than in the Plains, as I find the case in so many snakes.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 31*st August* 1911.

No. XXXVI.—FOOD OF THE SNAKE *RHABDOPS BICOLOR*.

Among other Snakes recently received from Shillong I have had six specimens of *Rhabdops bicolor*. I find that their food consists of earthworms. The stomach contained a great deal of mud mixed with which were fragments of various lengths of worms of substantial calibre. The intestine too was loaded with mud, probably derived from their Oligochæte diet.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 31*st July* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXXVII.—THE DIET OF A BULL-FROG (*RANA TIGRINA*).

In Vol. XX., No. 3 of our Journal, Mr. H. M. Chibber has a short note on the diet of a bull-frog, *Rana tigrina*. I wish to supplement the information he has given by some facts from my observation. In the course of a dissection of one of these animals, my students observed, in the earlier part of September, the remains of a land-crab in the stomach. The abdomen of the crab had already been digested, but the great chælæ and carapace were found inside the stomach. My mother also tells me that she has frequently observed frogs eating land-crabs in the paddy fields during the rains.

My friend Dr. V. G. Chiplunkar of Baroda informs me that he has once observed one of these frogs swallow a green snake of about medium size. The frog first caught its head in its mouth and then gradually swallowed it. He was unable to say anything about the species of the snake as it escaped in water before it could be secured. It seems, therefore, that the dietary of a bull-frog contains a very large variety of animals, and further observations on this point by our members would yield interesting results.

S. P. AGHARKAR.

BOMBAY, 1*st October* 1911.

No. XXXVIII.—NOTES ON THE INDIAN CHAMÆLEON (*CHAMÆLEON CALCARATUS*).

I send the following notes on two Chamæleons kept in captivity by me.

The first, which was subsequently seen to be a female, was found near Jubbulpore, C.P., and after some months of close captivity in a wire cage, was bought by me on 16th September 1911. Her colour was, as a rule, green of varying shades. In the bright sun, she rapidly turned a very dark earth colour, at night, a light greenish yellow. If angry, she would come out in thick black spots as large as small peas. Length about 13 inches. She lived then, on my office punkah ropes and ate large numbers of grasshoppers and very small frogs, of which latter she once devoured 8 in succession. Her gymnastic powers were extraordinary. To reach an insect out of range of her tongue, on another rope of the punkah, she would do what in gymnastic terms is called a "plant," *viz.*, extend her body into space, at right angles to the rope which she gripped with her tail and hind legs. This would extend her range considerably, but, if still not close enough to her prey, she would slide down the rope in stealthy jerks, still holding on by her tail and hind legs, until, as the two ropes converged she was near enough to shoot. Range of tongue, at the most, about 9 inches. Given a walk in the garden every day, she would make repeated efforts to escape, and invariably in the same direction, *viz.*, to a "mendi" hedge. Having reached the top of this, along it some 10 feet to where a twig of a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Gul Mohur tree approached to within a foot of the top of the hedge. Then, standing upright on her hind legs, she would catch hold of a thin frond of Gul Mohur and pull herself up on to the twig. Thence upwards to the main part of the tree where her colour, green and black, blended so perfectly with her surroundings as to render her detection and retrieval difficult. Defecated lifting a hind leg and would always clean her anus carefully against a twig or leaf. Excrement very full, like a turkey's. On level exposed ground her walk was slow and stilted, each leg being waved in a curious vacillatory motion before being set to the ground, but once under cover she strode forward freely, though very slowly.

On 5th October 1911 the male arrived, also from Jubbulpore. He seemed dry and emaciated, colour mustard yellow, with black spots, length about 14½ inches. No strength in his tail. However, on being placed on the punkah, he at once climbed to the top, under the ceiling and copulated with the female "a tergo" grasping her with all four legs. She was then a uniform light green. Coition took place three times that day and once the next. As he would not eat, he was put on a bush outside and water poured over him. He drank greedily, licking the drops off the leaves. His tongue then, though very dry and stiff, probably because his former master had never given him a drink, got to work on the grasshoppers. (From this time forward his colour day by day assumed a deeper tinge of green until in a month he was as green as the female.)

I now enclosed a bush some 4 feet high, set in a large pot with muslin netting on a frame and put both chamæleons into it. On 7th October 1911, *i.e.*, 2 days after mating, the female assumed a wonderful colour, *viz.*, jet-black, covered with spots of vivid emerald and ochre yellow, though at night she turned the usual light green. She now showed rage if the male came near her, rocking her body to and fro and gaping at him with faint hissings. He on the other hand would fly in ludicrous terror falling head-long from his perch if she came near, as though paralysed. From thence forward his object has been to put as great a distance as possible between them both. On the 28th October his skin began to peel in large patches. The female showed obvious signs of pregnancy by then, and invariably moored herself securely to her roosting perch by 2 or 3 turns of her tail, resting her belly carefully and evenly along the branch. I now scooped out a handful of earth at the bottom of the bush, and covered it with a tile, so as to make a kind of "cabin." On 9th November 1911 the female descended into the hole and began to dig like a terrier, packing the loose earth with her fore legs and kicking it out behind her with her hind legs. At night she roosted in the bush, but low down. All next day, the 10th, she dug furiously in the loose mould and did not emerge at night. Next day, the 11th, a very attenuated chamæleon emerged at 2 p.m. and spent all afternoon in pulling the loose earth back with her fore paws, ramming it

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

well behind her with her hind legs. Colour first muddy, then vivid green and black. Roosted all night. Next morning 12th completed the filling up of her burrow.

On the 13th I had her put into the garden and began to search for the eggs. As they are evidently deep down, I had the whole bush gently lifted up by the roots, when a heap of eggs were visible in the loose mould at the bottom of the pot, nearly a foot from the surface. Eggs were whitish, shaped like a snake's, a perfect oval, about a half inch by a quarter inch, and numbered 31. I replaced 20 and the rest were put in another pot. The female still drives the male away if he comes near her. A few general remarks on these animals as pets may be of interest. They are voracious and should be watered, on a bush, at least once in two days. They will not drink out of a receptacle. Their gymnastic feats are a source of endless amusement and interest and they give the impression of possessing an intelligence much above that of other reptiles. They are long sighted and very tenacious of purpose. If put on the floor of the verandah my own would invariably first take their bearings and then make for the hedge, climbing it at the same spot in order to catch the over-hanging branch of the Gul mohur tree. Their dominant purpose is still to escape into the high branches of this tree. If kept in a wire cage their persistent efforts to escape lead to the skin of their nose being frayed to the bone, but a cage of mosquito netting obviate this mishap.

I should be grateful for any information the Society can give me as to their distribution, also the size they attain. An informant tells me of one over two feet long, picked off a tree during a beat in one of our Southern districts and kept tied to a peg for two days when its captors killed it and dried its tongue and heart for a charm. I should have unhesitatingly put this animal down for one of the so-called 'iguanas' but for the description of its gait, shape and colour and the incident of its death, for while the tongue and heart of a chamæleon have noted magical properties in this country, I never heard the same of the iguana.

C. CHENEVIX TRENCH, I.C.S.

DAMOH, C. P., *15th November* 1911.

[The iguana referred to is probably the Indian Monitor or 'Ghorpad' (*Varanus bengalensis*). The largest chamæleon which is in our Museum measures snout to vent. 7½ inches, tail 8½ inches, a total length of 16 inches.—EDS.]

No. XXXIX.—SNAKE EATING A SNIPE.

On 20th November while I was out snipe shooting with my wife a curious incident occurred which I think is of sufficient interest to record. I had brought down a couple of Snipe and my wife had gone to pick up one while I went to get the other. On approaching the spot where the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bird had fallen my wife saw a large snake and called out to me "there is a big snake here," almost immediately adding "and it is eating the snipe." She stood quite still to observe and saw the snake open a cavernous pair of jaws and seize the snipe by the tail, but I, foolishly hurrying up, attracted the attention of the culprit who dropped the snipe and made off. I put a charge of shot into the snake as it disappeared, but it managed to escape into a clump of bushes, so I was unable to identify it, but from the glimpse I got of its tail and body I have little doubt that it was a rat-snake (*Zamenis mucosus*). The snipe's tail was somewhat mauled and covered with saliva when picked up.

F. E. W. VENNING, CAPT.

PYAWBROE, *7th December* 1911.

No. XL.—SOME NOTES ON THE HATCHING OF THE AGAMOID LIZARD (*CALOTES JERDONI*).

On a pouring wet day, 11th August 1910, I found by the side of a jungle path near Haka, Chin Hills, (alt. 6,200 ft.) one dozen lizard's eggs, the largest of which measured ·75 × ·55 inches. The eggs were scattered irregularly over an area of about three feet by six inches, and were all lying on the surface of some moss under a pine tree. The situation was a steep hillside and there were torrents of water coursing down the path and through the jungle, but the position of the eggs, which was somewhat raised and was also sheltered by the tree, pointed to the conclusion that they were still in the place where they had been originally deposited. On reaching home I opened one of the eggs and extracted a living young one of this species, apparently almost ready to emerge. The position of the hatching in the egg was as follows:—head bowed on chest, nape occupying the pole of the egg, back considerably bent, tail neatly curled inwards on the belly, fore limbs crossed, I think, on the chest, but I could not be certain of this point nor of the position of the hind limbs as the lizard stirred almost immediately on the egg being opened. In 1908 I had twelve eggs of this species which hatched on and after the 20th August, so I placed the remaining eggs on some moist earth in a large chattie and awaited developments.

At 7 a.m. on the 28th August I noticed that one of the eggs had several cuts in the shell and the hatchling's snout was visible through one of the openings. I promptly placed a second egg in strong spirit for future examination and returned to egg No. 1. This I placed with great care under the microscope using a low power objective (1 inch) and could just detect the fœtal tooth as a minute triangular white point projecting under the rostral shield. By 8 a.m. nothing further had occurred, but the little lizard was breathing deeply, each breath causing an efflux of moisture from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the slits in the shell. I had to leave the egg now and could not resume my observations till 10-40 a.m. when I found the young lizard's whole head protruding from the shell and its eyes wide open and fully conscious of my movements. After about five minutes the hatchling made an effort to obtain its release and at the second attempt wriggled out of its shell and without pausing ran to the edge of the chattie and fell over. I rescued it and placed it in a finger bowl. It was extremely lively. The navel aperture was distended and a globular piece of whitish (apparently albuminous) matter was extended measuring about one line in diameter. This subsequently became rubbed off on some earth. At 11 a.m. the measurements were; head and body 1·2 inches, tail 2·8 inches. The dorsal crest and two rows behind the eyes showed as distinct ridges, and in all other respects the specimen was perfectly developed. A little albuminous matter remained in the shell, which was extremely tough and of the consistency of white kid glove. Egg No. 2 showed no signs of cuts when I put it in spirit, but at about 11 a.m. I found the hatchling had broken the shell and struggled half out before succumbing.

The remaining eggs all hatched similarly except that the occupants were not so much disturbed and had the navel aperture quite free from any matter when they emerged and showing merely as a longitudinal slit about $\frac{1}{8}$ inch long.

The hatchlings had in a very marked degree the power, conscious or unconscious, of assimilating their colour to the hue of their surrounding, becoming brownish when placed on bare earth or a brown twig and greenish when placed on a green leaf.

A full-grown female of this species taken by me on 10th May 1910 was found to contain 12 eggs, the largest of which measured ·6 × ·25 inches, but in this case the eggs were very soft skinned and contained no traces of any development of the embryo.

Major Wall has described the finding of a pair "in copula" on 25th August in the Khasi Hills (B. N. H. S. J., XVIII, page 506). It would appear, therefore, from the scanty records above that the period of gestation lasts a whole year, but further observations would be interesting.

The activity of the hatchling immediately on emergence from the egg and its ability to adapt its hue to that of its environment are evidently inherited protective devices of considerable importance to the species when one remembers the large number of Ophidia, not to mention birds, that prey upon it. In this connection I might mention that a very young mongoose I had, which was also very weak on its legs, one day pursued and captured an adult *C. jerdoni* to my utter astonishment. The lizard was obviously very much fleeter of foot, but the mongoose followed slowly but relentlessly until the lizard was apparently run to a standstill, when it was captured and devoured.

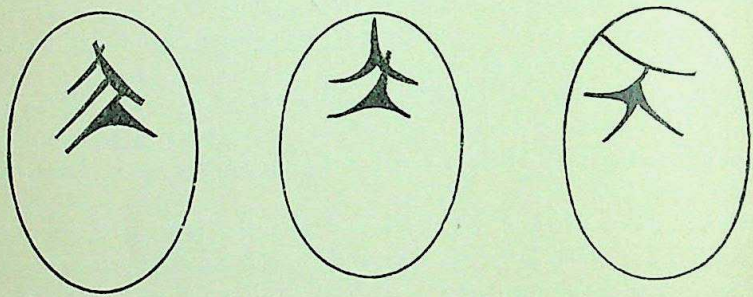
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

It is to my mind a most wonderful endowment of nature which enables the young Calotes to make full use of its limbs the moment it sets foot to earth after being curled up in its egg during the whole of its prenatal existence, and a very powerful objection to the argument that the young have to learn everything from example. "Experientia docet"—it is trying that teaches, but here we have the first trial a fully perfected art achieved without precept or example.

The method of opening the egg for the exit of the lizard is also of some interest by reason of the economy of energy shown. I append a rough illustration of the cuts in three of the eggs prior to the appearance of the young one. The table shows the time taken in the actual process of hatching as far as it could be observed.

No. I. No. VI. No. V.



× 2.

Another question which suggested itself to my mind was whether the exudation of moisture, noticed in almost every case after the first cuts had been made and caused by the inhalations of the lizard, were merely accidental overflowings of albumen or an intentional device of nature for softening the hardness of the leathery integument and so facilitating the exit of the hatchling?

No.	*First cuts observed.*	*Hatchling out of shell.*
1.	7 a.m. (28th)	10-45 a.m. (28th).
2.	Placed in spirit.	
3.	7 a.m. (28th).	Not noticed: shell empty 3 p.m.
4.	6-30 p.m. (28th).	8-20 a.m. (29th).
5.	8 a.m. (29th).	11 a.m. (29th).
6.	11 a.m. (30th).	4 p.m. (30th).
7.	11 a.m. (30th).	4 p.m. (30th).

Remainder escaped observation.

F. E. W. VENNING, Capt.

Pyawbroe, *7th December* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XLI.—BREEDING OF MACCLELLAND'S CORAL SNAKE (*CALLOPHIS MACCLELLANDI*).

Among 128 snakes sent me from Shillong this year, I have had four specimens of Macclelland's coral snake. I can find no observations of the breeding habits of this species, so that the receipt of a gravid ♀ is worthy of remark. This specimen, which was killed in August, measures 1 foot 11 inches. It contained 6 eggs, 2 in one ovary and 4 in the other. The largest of these eggs measures $1\frac{5}{16}'' \times \frac{7}{16}''$. On cutting this open I discovered a small embryo lying in a chamber just beneath the ovicular membrane. The embryo would, I judge, measure one to one-and-a-half inches unravelled. The head is formed, the eye, mandible, and a beaked snout evident, and the heart also visible outside the abdomen. The condition is exactly similar to that seen in the eggs taken from the abdomen of the *Lachesis monticola* included in the same collection. It seems to me probable that these eggs were on the eve of being discharged, but on this point I cannot of course speak with certainty.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 31*st August* 1911.

No. XLII.—THE MADRAS AQUARIUM.

A most interesting little guide* to the Madras Aquarium has just been published by Dr. J. R. Henderson, the Honorary Director. This guide contains not only a general account of the Aquarium and of the fish usually to be seen in it but also a number of interesting observations on the habits of fish and marine reptiles that are liable to escape notice unless attention is called to them. I have therefore gathered together some of them in the following notes, which I hope that Dr. Henderson will see his way to elaborate :—

1. "Finally it may be remarked that among some of the inmates of the Aquarium the colours fade after a time. This is particularly noticeable with regard to the beautiful red bands of *Lutianus sebæ*" (p. 7).

I have noticed myself that certain silvery freshwater fish (*e.g.*, *Notopterus kapirat*) turn black after a few weeks' exposure in an aquarium; Dr. Henderson's remarks apply, of course, to marine species.

2. "The sea-snakes are usually represented by *Enhydrina valakadien*, which is very common on the Madras Coast, but various species of *Hydrophis* and *Distira* will be found from time to time. In spite of their extremely poisonous nature, they rarely inflict injury on the fish living in the same tank, yet more than once sea-snakes have fallen victims to and been eaten by the latter. The snakes are fed on small dead fish" (p. 8).

---

* *Guide to the Marine Aquarium*, Madras. Printed by the Superintendent, Government Press,. Price 1 anna.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

3. "The Green or Edible Turtle (*Chelone mydas*). Common on the Madras Coast. This species is usually described as herbivorous, but local specimens are quite as carnivorous as any of the other turtles" (p. 13).

4. "[This tank] contains at present a shoal of a single species of Sea-Perch (*Lutianus jahngarah*) which . . . . are noticeable for the high degree of intelligence which they exhibit at feeding times. The appearance of an attendant bearing a pail, even half-way across the Aquarium, is sufficient to throw them into a state of wild excitement" (p. 16).

The difference in intelligence (? or eyesight) between these fish and other species in the Aquarium is most marked, as I can testify from personal observation in the circumstances described by Dr. Henderson.

5. "The species of *Serranus* exhibited in the Aquarium regularly go to sleep every night at the bottom of the tank, where they remain motionless till morning. Several fish in the Aquarium have the same habit, while others at night simply remain motionless in the water and do not rest on the bottom. On the other hand many fish do not appear to sleep, as they keep constantly moving all night" (p. 17).

I understand that the *Serrani* when asleep lie on one side on the bottom.

N. ANNANDALE.

CALCUTTA, *January* 1912.

No. XLIII.—THE LIFE OF A DOG TICK.

The small brown tick on a dog sucks up the blood until it swells up and then it falls off. It will be noticed that there is always a small tick attached to every swollen one—this is the male. After the swollen tick has fallen off, it climbs up the wall into the ceiling or hides in any convenient crack and deposits its eggs (some thousands), 40 per cent. of these in turn hatch out and become minute ticks which get on to the dog and suck its blood till they in turn swell up to the size of about six pins' heads, they then drop off and seek some crack in the wall or some picture on it and in time change into the ordinary brown tick. Anyone who keeps a dog in his room might notice ticks on the wall.

W. J. MASSY, CAPT.,
12th Pioneers.

KIRKEE, 26*th August* 1911.

[Mr. F. M. Howlett, 2nd Imperial Entomologist, Pusa, has kindly supplied the following note on the above :—

"Ticks are generally divided into two main families, Argasids and Ixodids · the commonest argasid in this country is the flat fowl-tick (*Argas persicus*), while the dog-tick (*Rhipicephalus sanguineus*) is an ixodid. Ixodids have a characteristic horny shield on the back, which nearly covers the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

back in the males but is comparatively small in the females ; this shield is absent in argasids, whose skin is uniformly leathery and often covered with little warts and pits. The female ixodids gorge themselves with blood to a much greater extent than argasid females are accustomed to do, and there are various differences in habits, length of life (much greater in argasids), number of eggs laid (much greater in ixodids), number of moults, relation to the host, sexual relations, and so on, as well as in structural characters.

As regards the life-cycle of ticks, there appear to be several types, varying in the degree of connection of the different stages of the tick with its host or hosts (*i.e.*, the animal on which it feeds). The number of stages in argasids is usually four (though sometimes five or even six) ; larva, nymph 1, nymph 2, adult : in ixodids 3, larva, nymph, adult. In both the larva is six-legged , the other stages eight-legged. In the relations of the different species to the host, Nuttall (*Parasitology*, Oct. 1911) has defined five types as being of ordinary occurrence. The relations of argasids are of types 1 and 2, in which the ticks feed in succession on an indefinite number of hosts, making a large number of comparatively small meals of blood and leaving the host when satisfied, the adult females often laying a batch of eggs after each meal. The relations of ixodids are of types 3, 4 and 5 ; in type 3, each stage (larva, nymph. and adult) feeds on a separate host, dropping off and moulting when full-fed (*e.g. Rhipicephalus sanguineus*) ; in type 4 the larva and nymph feed on the same host and the adult on a second host (*e.g.*, *Hyalomma ægyptium*, a common Indian cattle-tick), while in type 5 (genus *Boophilus* only) the larva, nymph, and adult stick to the same host throughout.

In most, if not all, species the female tick, after filling up with blood, sooner or later drops off the host and lays her eggs in heaps on the ground in any convenient sheltered place, and the larval ticks after hatching almost always crawl up anything within reach, such as walls or grass-stems, and there, with the utmost patience and tenacity of purpose, they wait for the coming of a suitable victim, to whom they at once attach themselves. Their subsequent behaviour is in accordance with one of the types indicated above, and this should be borne in mind in applying measures for getting rid of them : it is of little use to concentrate on keeping a dog's coat clean when all the time the floor or the walls of the place he inhabits may be harbouring numbers of eggs, or of larvæ, nymphs, or adults, which have dropped off him merely to moult and then return to the charge."—EDS.].

No. XLIV.—ASILID OVIPOSITION.

Time—8 a.m., April 27th, 1911.

Weather—Dry and hot.

Place—The Gooseberry plot of the vegetable garden at Pusa, the exact spot selected being a dry, wrinkled, worn-out gooseberry leaf that would

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

have dropped down in the course of three days. The oviposition was made in the fixed end of the leaf which had shrivelled up into a few pouches, the ootheca being deposited into one of such pouches.

The soil in and about the gooseberry plot was moderately hard, very dry and somewhat sandy. Digging showed absolutely no trace of any subterranean insects that the newly hatched-out larvæ might be expected to feed upon nor any crannies or fissures through which they could easily make their way deep into the earth. The place was not at all shady nor well-protected from wind and rain, though the plant was in the midst of numerous other similar plants. The season was just after the harvesting of the fruits.

Movement of the fly just prior to oviposition :—

The Asilid was observed darting from place to place apparently very restlessly. It first perched on a green leaf, but left it at once and went to another which was also discarded ; the next one was also rejected and so also the fourth and so on for five times till it came across the suitable leaf.

Manner of oviposition and posture of the fly while ovipositing :—

The leaf was not quite horizontal with the ground but at some inclination and the Asilid sat at once parallel to the leaf, her face pointing down towards the ground and tail upwards to the plant. The first position in which she happened to sit seemed quite convenient for her, and she did not move about on the leaf to accommodate herself more comfortably.

While ovipositing the tail was slightly curved all along pointing to a fixed spot on the leaf ; probably the semi-fluid looking substance gradually flowed out to occupy the entire portion of the pouch.

She was in that position for nearly ten minutes. Her wings rested in repose, all the parts of her body remaining stationary save the tail which was noticed moving in and out like the retractile sting of an *aculeate hymenoteron*. With each movement a very small quantity of white stuff could be faintly discerned to be coming out, but the fear of scaring away the fly stood in the way of knowing then the exact nature of the substance or the order in which the different constituents of the stuff were coming out, though subsequent examination cleared both the difficulties. After about ten minutes the fly suddenly flew away

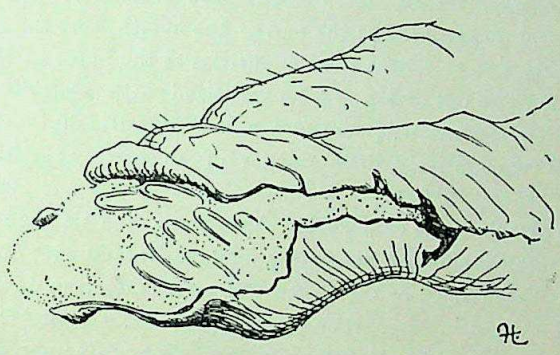
The Ootheca :—

It was very irregularly shaped, pretty firmly lodged in the pouch of the leaf the greater portion being concealed from view. At the first sight it would give one the impression of white excreta of some birds not infrequently seen on leaves and branches and a superficial examination did not reveal the existence of any eggs ; all that could be seen was a very finely porous, frothlike white mass having the consistency

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of freshly fallen snow, not of uniform level all throughout but undulating here and there. With time the mass gradually set harder, ultimately turning into the consistency of very fine camphor granules firmly stuck together. On breaking open a portion of the frothlike substance beautiful eggs were discovered. The eggs were oval-shaped, very small in size (about $\frac{1}{8}'' \times \frac{1}{61}''$), colourless, having prismatic reflections, very closely in touch with one another, the portions of the eggs in touch being the sides, the extremities being more or less free. There were two tiers of eggs one above the other. A colourless but palpable exudation held the eggs on the tiers together, the whole egg-mass being encrusted in the external "froth." After nearly a fortnight the egg-mass turned yellowish.



The other substance was very easily soluble in absolute alcohol.

The size of the ootheca was above $\frac{3}{4}'' \times \frac{1}{2}''$.

The egg-mass was put in a vessel with as much earth and moisture as were deemed necessary, taking additional care to put in earth of the very place on which the leaf was on the point of falling. But the eggs gradually shrivelled up and did not hatch. A discovery of one or two empty egg-cells suggested the possibility of the presence of newly hatched-out larvæ but a search to find them out was futile.

As the use of the incrustation was obviously, among other things, to protect the egg-mass from undue exposure, it is not impossible that the opening made into the mass was wholly or partially responsible for the eggs not hatching in the presence of conditions which, though of course artificial, were made as favourable as possible.

S. K. SEN,

Asst. to 2nd Imp. Ent.

PUSA, *December* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XLV.—CATERPILLAR PEST ON COTTON IN KHANDESH.

I was recently summoned to Jalgaon. Khandesh, to investigate and suggest remedies for what was said to be a very serious caterpillar pest of cotton, and some short notes on my observations may not be without interest.

The pest proved to be the common, semi-looping, noctuid caterpillar (*Cosmophila erosa*). Of this Lefroy (*Indian Insect Life*, page 453) writes as follows. It "is common as a green semi-looping larva on cotton and malvaceous plants : the male moth darker in colouring than the female. The semi-looping larva is a common pest of cotton (*Malachra capitata*), bariar (*Sida rhombifolia*), and some other plants during the rains."

The attack in the present case took place during September, and when I reached Jalgaon on September 26th, the main portion of the attack was over. The caterpillars appeared about the second or third week in September, and disappeared at the end of the month. At the time of my visit I was only able to collect large quantities of the pupæ in the folds of leaves. Nine pupæ out of ten were parasitised with *chalcidid Hymenoptera*, with a few *ichneumonids*, and also a few parasitic diptera (*tachinids*). There is thus comparatively little danger of an early repetition of the attack.

While the attack of the caterpillars was severe, the damage done was great. The stalks only of the plants remained standing. Every bit of leaf had been eaten away by the pest. The serious damage done, however, was not very extensive. Reports only being to hand from four or five villages, namely Jalgaon itself, Pimprola, Sirshola and Jamner. All these were within a radius of twenty-two miles of Jalgaon.

The caterpillars have not limited their attention to cotton, but have also attacked ambadi (*Hibiscus cannabinus*), which is often sown as a mixture in the cotton fields, and Mug (*Phaseolus mungo*) and Udid (*Phaseolus radiatus*), which are sown in admixture with jowar (millet).

R. S. KASARGODE,
Lecturer on Entomology, Poona Agricultural College.

POONA, *October* 1911.

No. XLVI.—NOTE ON THE BUTTERFLIES *LETHE KANSA* AND *DOPHLA PATALA*.

May I issue a small defence to the charge of inaccuracy brought against me by Mr. Hannyngton in his note on page 286 of the last number (No. 1. Vol. XXI) of the Journal, though the charge, at first sight, appears justified. The fact was that my "Notes on some Butterflies from the Indian Region" had been written long before, and as far as my recollection goes, were already in proof in the Editor's hands when the number of the Journal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with Mr. Hannyngton's article reached me. I had thus no opportunities to refer to his record. My specimen of *L. kansa* was taken on Ayarpatta, Naini Tal, about 7,000 feet, in June 1903, and though I was frequently on Cheena, I never saw the species there. June and July were probably too late, for Mr. Hannyngton's record would indicate that the species appears in a spring brood.

As regards its range in Sikkim, where I have collected a good deal, my experience was that the species was fairly common up to about 2,000 feet, but was never seen about 3,000. Mr. Elwes' record quoted extends the range, but I fancy its appearance at high altitudes is rare. I see from the last number of the Journal (Vol. XXI, p. 53) that Major Tytler has taken *L. kansa* only at the foot of the Naga Hills, so my remarks as to the altitudinal range of the species remain generally good.

It would, as Mr. Hannyngton says, be interesting to know something of the food plants of the larva of *D. patala* or *D. taooana* in Lower Burma. Can any one oblige?

Having collected a good deal in Kumaon myself years ago, I was particularly interested in Mr. Hannyngton's valuable list. and I had hoped, when it was appearing, to write to him and give him such additional information as I had. I was at the time unfortunately overburdened with official work and have since been away on furlough. I hope to be able to exchange notes with him at some later date when I have my books and collections again about me. At present I can only remember that I wished to communicate to him a note of the capture of two males of *Poritia hewitsoni*, Moore, near Ranibagh, 2,000 feet, in April 1903. Mr. Hannyngton remarked that he had not met with the species in Kumaon.

G. W. V. DeRHÈ-PHILIPE, F.E.S.

MADRAS, *7th December* 1911.

No. XLVII.—*PAPILIO POLYTES* IN BANGALORE.

With reference to Mr. Fryer's appeal for information concerning *Papilio polytes* which appeared in the last number, it may be of general interest to record that the species is trimorphic in Bangalore. All the three forms were reared in the insectary attached to the Entomological Laboratory here, from eggs found on the Curry leaf tree (*Murraya kœnigii*, Spreng.). The association of mimics and models came to my notice only once at Honnali, Shimoga District, where *P. hector* and the *romulus* were observed together on *Poinciana regia*, Bojier.

K. KUNHI KANNAN,
Assistant in Entomology to Dr. Coleman,
State Mycologist and Entomologist.

BANGALORE, *22nd December* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XLVIII.—A NOTE ON *TRICHOSANTHES DIOICA*, ROXB.

C. B. Clarke's description of the plant (p. 609, Hk. F. B. I., Vol. II) runs thus :—"T. dioica, *Roxb. Fl. Ind.*, III, 701 ; leaves cordate, oblong acute, petiole scabrous woolly, male flowers not racemed, woolly without, anthers free, *Wall., Cat.* 6692, A. B. D.

Throughout the plain of North India, from the Panjaub to Assam and Eastern Bengal ; common.

Stems twining extensively, more or less woolly and scabrous *Diœcious*. *Leaves* 3 by 2 in., harsh, sinuate dentate, not lobed ; petiole $\frac{3}{4}$ in. ; tendrils 2-fid. Male *peduncles* paired, the second-flowering often 2 in., but not racemed in any example at Kew. *Calyx-tube* $1\frac{3}{4}$ in., narrow. *Fruit* 2-$3\frac{1}{2}$ in., oblong, or nearly spherical, acute, orange-red. *Seeds* $\frac{3}{8}$-$\frac{1}{2}$ in., half ellipsoid, compressed, corrugate on the margin."—United with *Trichosanthes nervifolia, Linn.*, D. C. *Prodr.* iii, 314 by Bentham in *Fl. Austral*, iii, 315. "Roxburgh says 'Stamens three distinct' which has been repeatedly verified in the living plant."

Be it noted that *T. nervifolia* is figured by Rheede in *Hortus Malabaricus*.

When in a former series of papers of mine under name "*The Poisonous Plants of Bombay*", I published a description of *T. cucumerina*, Linn, which is abundantly found in the Dekkan and Konkan, Lt.-Col. Peters said to me that there was found in Eastern Bengal a plant under the name of Patol which was edible. Its botanical name is *Trichosanthes dioica*.

In his letter to our Hon. Secretary, dated 10th November 1911, from Dinajpur (E. Bengal) Lt.-Col. C. T. Peters writes the following interesting note on *Trichosanthes dioica*, Roxb. (Hindi, *Pulwul* ; Bengali, *Patala*) :—"The gourd is used as an esculent vegetable and especially prized, as it is in season when other vegetables, both European and Native, are scarce during the rainy season.

The different ways of preparing the vegetable in Bengal are :—(1) The entire gourd is scraped and fried in butter or oil without removing the seeds. (2) The entire gourd is scraped, cut in halves lengthwise and fried with seeds. (3) The entire gourd is scraped, the seeds are removed by a long incision and the inside is stuffed with minced meat and spices and fried (4) The skin is peeled, the seeds are removed and the gourd is cut in halves lengthwise or into smaller pieces and fried. (5) The skin is peeled, the seeds are removed, and the gourd is cut into circular or semi-circular pieces and fried. The gourd is precisely similar in shape and size to the Bombay variety* which is, however, poisonous ; whereas this is a most

* There is no Bombay variety of this plant as far as I know. Col. Peters' plant now shown is strictly a native of Eastern Bengal and Assam. The poisonous plant described by me is *T. cucumerina* (see in our Journal, Plate E., letter press Part iv. of my Poisonous Plants of Bombay.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

useful kitchen vegetable and much appreciated by the native population, who also use the tender leaves and stalks as a vegetable, especially recommended by *Vaidyas* as an appetiser to invalids when recovering from fevers. The root is also used as a cathartic." Here ends Col. Peters' interesting note.

The only counterparts of Col. Peters' Eastern Bengal edible plant *T. dioica*, Roxb., on this side of India are the popularly called Tondlen, (*Cephalanden indica*, Naud.) and the Snake-Gourd, *Trichosanthes anguina* which are found all over the Dekkan and the Konkan. They are greatly appreciated as highly valuable and dainty vegetables. They are mostly found in the rainy season; and even now, after the rains. Besides being cooked in the various ways described by Col. Peters, we cook our *Tondlen* with rice mixed with spices. The dish turned out serves as a valuable morsel to Hindus on festive occasions even in humble homes, as well as at quiet homely dinner parties. I show a specimen of the fruit, which is smaller than that of Col. Peters' plant *T. dioica*, Roxb. The *snake-gourd* is also used in several ways in Indian homes. Whether it will be relished at an English table is a matter of acquired taste.

K. R. KIRTIKAR, Lt.-Col.,
I. M. S. (Ret.)

ANDHERI, SALSETTE,
Januray 1912.

No. XLIX.—NOTES ON THE FLORA OF THE VALE OF KASHMIR.

The Kashmir State, like ancient Gaul, is divided into three parts, the northern province of Baltistan with the mighty Nanga Parbat on the west, 26,229 feet high, towering over the whole State, Ladakh on the east with its many elevated plains, and Nun Kun, 23,447 feet in height, also on its left flank, then Kashmir on the south with the River Jhelum running across it, Kolahoi, 17,839 feet over the Lidar Valley, and Haramouk, 16,908 feet over the Sind Valley, while on the south is the Pir Panjal Range, with such giants as Tatakuti, 16,024 feet, and Brahma Sakal, 17,590 feet high, forming the highest peaks.

The Province of Kashmir is entered from the west at Kohala below Murree, where the ground level on the banks of the Jhelum is 2,050 feet above mean sea level; the cart road into the State follows the lead of the river to Baramula, running due north for 21 miles to Domel, then roughly to the east for 40 miles to Uri, the level being about 4,000, and 29 miles more to Baramula, where the Valley of Kashmir is entered at a base-level of 5,170. Srinagar lies 33 miles to the east, in the centre of the Valley, at

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a level of 5,235, and Islamabad 32 miles farther on at a level of 5,385 feet, where several streams join to form the River Jhelum. On the east of the province are the Lidar and Sind Valleys, the centres of which are Pailgam at 7,200 feet, and Sonamarg at 8,600 feet, the latter so called because the rays of the morning sun shining on the ragwort, dandelions, buttercups, marsh-marigold, and potentillas that clothe its slopes, give it the appearance of a veritable "field of the cloth of gold." To the north lies Nagmarg at an elevation of 8,700 feet, with the Lolab Valley below at a level of about 5,700, and on the west Gulmarg, "the meadow of flowers," a little Valley on the eastern slopes of the Pir Panjal Range, at a height of 8,400 feet, having another meadow Kilanmarg above it at a level of 10,000 feet, the whole surmounted by Apharwat, 14,800 feet high, at the north end of the hills. Thus the flora of the Vale of Kashmir have a range of between 2,000 and 15,000 feet above mean sea level, and species of almost every order and genus of flora are to be found in the valley.

Going up the cart road at the end of April, the ravines of the Jhelum will be found covered with pink and red blossomed oleander, *Nerium odorum*, and a number of wild fruit trees lining the road, such as the large red-flowered pomegranate, *Punicea granatum*; pink crab-apple, *Pyrus baccata*; white pear, *P. Pashia*; pink plum, *Prunus Puddum*, and almond, *P. amygdalus*; white cherry, *P. cerasus*; fig, *Ficus Roxburghii*, and olive, *Elaeagnus umbellata*, also the mulberry, *Morus alba*, with its long red and white fruit, and *M. serrata* with its smaller purple fruit. The avenues of the valley road from Baramula to Srinagar, and those in the capital itself, are of the tall poplar, *Populus viliata*, the thick white pollen of which coats the ground so extensively in the early spring as to give it the appearance of having been snowed on.

After the winter frosts have passed, the first flowers to bloom after the snows melt are yellow primroses, *Primula floribunda*, and purple many-headed primulas, *P. denticulata*, also the bright hued lilac iris, *I. nepalensis*, so characteristic of the village cemeteries of Kashmir, purple and yellow loosestrife, *Lysimachia chenopodioides*, and *L. japonica*, the little purple blue-tinged androsace, *A. lanuginosa*; pink centunculus, *C. tenellus*; the bright blue pimpernel, *Anagallis arvensis*, and the small flowered myrtles, *Myrsine semiserrata* and *africana*. With the advance of spring are to be found on the higher margs the white blossoms of podophyllum, *P. Emodi*, which later turn into large scarlet berries; yellow *Corydalis Govaniana*, and purple *C. rutæfolia*; yellow tower-mustard, *Arabis glabra*, and the white variety, *A. amplexicaulis*; yellow and white aromatic leaved skimmia, *S. laureola*, the berries of which first turn green then red; white *Staphylea Emodi*; purple clover, *Trifolium pratense*; white pink-edged Dutch clover, *T. repens*; the small yellow *Trigonella pubescens*; delicate white spirœa, *S. vestita*; pink bramble, *Rubus niveus*, and the white species, *R. macilentus*; the white wild

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

strawberry, *Fragaria vesca*, and the yellow *F. indica*; white and red roses *Rosa sericea* and *R. macrophylla*, the fruit of which is bright red; white *Deutzia staminea*; pink and white *Viburnum fœtens*; white pink edged Aaron's Rod, *Ainsliœa aptera*; white *Gerbera lanuginosa*; yellow ox-tongue, *Crepis fœtida*; yellow *Salvia glutinosa*; blue *S. lanata*; blue mint, *Nepeta campestris*, and the pink variety, *N. ciliaris*; purple *Brunella vulgaris*; pink corn snap-dragon, *Antirrhinum Orontium*; and many veronicas, blue *V. biloba*, purple and white *V. serpyllifolia*.

At a lower range are climbing clematis, white *C. montana*, purple *C. barbellata*, and yellow *C. Gouriana*; white purple tinged anemonies, *A. rivularis*; white meadow-rue, *Thalictrum pedunculatum*; brilliant red *Adonis æstivalis*; the bright yellow buttercup, *Ranunculus hirtellus*; white columbine, *Aquilegia pubiflora*; blue larkspur, *Delphinium denudatum*; yellow marble watercress, *Nasturtium palustre*; white cress, *Cardamine impatiens*; yellow cress, *Sisyimbrium Wallichii*; the yellow and purple violet, *V. biflora* and *V. canescens*; St. John's wort, *Hypericum perforatum*; yellow *Reinwardtia trigyna*; pink geranium, *G. lucidum*; yellow *Oxalis corniculata*; white *Rhus punjabensis*; white *Osmorhiza Claytoni*; white chervil, *Anthriscus nemorosa*; yellow *Lactuca scariola*; yellow and purple dandelions, *Taraxacum officinale*; the white jessamine, *J. officinale*; white pink tipped *Lathraea squamosa*; the vervain, *Verbena officinalis*; white *Litsea consimilis*, and the yellow star of Bethelehem, *Gagea persica*.

By summer time, on the heights are to be found the white flowered baneberry, *Actœa spicata*; red or white peonies *Pania Emodi*; yellow barberry, *Berberis lycium*, with later violet berries; orange coloured *Erysimum hieracifolium*; white *Eutrema primulæfolium*; white hedge-garlic, *Sisyimbrium alliaria*; pretty pink *Dianthus angulatus*; white chickweed, *Cerastium vulgatum*; pink or white *Dictamnus albus*; white flowered holly, *Ilex dipyrena*; dark violet lupin, *Thermopsis barbata*; dark purple-red *Indigofera gerardiana*; yellow *Potentilla albifolia* and crimson *P. nepalensis*; yellow agrimony, *Agrimonia eupatorium*; white *Cotoneaster acuminata*, with its subsequent long bright red berries; white orange-scented *Philadelphus coronarius*; green black currants, *Ribes nigrum*, and red currants, *R. rubrum*; white stonecrop, *Sedum linearifolium*, and the pink species, *S. trifidum*; yellow *Pimpinella acuminata*; white or red *Chœrophyllum acuminatum*; white celery-leafed aromatic *Selenium vaginatum*; white and purple angelica, *A. glauca*; white *Heracleum cachemiricum*; pink and white *Abeia triflora*; the Alpine woolly edelweiss, *Leontopodium alpinum*; woolly white or yellow *Anaphalis nubigena*; downy yellow *Hieracium vulgatum*; yellow sowthistle, *Sonchus oleraceus*; the pink rhododendron, *R. campanulatum*; yellow *Chrysosplenium tenellum*; white privet, *Ligustrum compactum*; the small yellow cynanchum, *C. glaucum*, and green-purple *Scrophularia calycina*; lilac yellow-tinged eye-bright, *Euphrasia officinalis*; purple wild thyme, *Thymus serpyllum*; blue *Salvia lanata* and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

yellow *S. glutinosa*; pink motherwort, *Leonurus cardiaca*; yellow spurge *Euphorbia pilosa* and yellow-green calanthe *C. tricarinata*.

At a lower level during the summer are seen white flowers of *Gypsophila cerastoides* and *Arenaria orbiculata*; lilac mallow, *Malva silvestris*; yellow and pink argyrolobium, *A. flaccidum* and *roseum*; pink or white *Tillœa peutaudra*; yellow *Datisca cannabina*; the marsh pennywort, *Hydrocotyle javanica*, and hare's ear, *Bupleurum tenue*; bright yellow cudweed, *Gnaphalium luteoalbum*; purple and white convolvulus, *C. arvensis*; blue or white *Evolvulus alsinoides*; white nightshade with black berries, *Solanum nigrum* and the purple species with red berries, *S. dulcamara*; yellow or blue wild gooseberry, *Physalis minima*; the white trumpet-shaped datura, *D. stramonium*; yellow-mullein, *Verbascum Thapsus*, and celsia, *C. coromandeliana*; delicate rains' plants such as blue *Platystemma violoides*, purple *Chirita pumila*, and white *Didissandra lanuginosa*. Many varieties of skull-cap blossom in the monsoon, yellow *Scutellaria angulosa*, and dark blue *S. grossa*, also the white purple-spotted *Plectranthus Gerardianus*. In August the Dal Lake near Srinagar will be found covered with large white and rose-coloured lotus flowers, *Nelumbium speciosum*, which are tended for religious services and reach a diameter of ten inches.

Towards the end of the summer are found on the higher ranges the light and dark neutral-tinted flowers of monkshood, *Aconitum heterophyllum*, and at greater elevations the small purple variety of aconite *A. Lycoctonum*; pink *Silene tenuis* and white *S. Griffithii*; pink milkwort, *Polygala triphylla*; the purple species *P. crotalaroides*, and the yellow, *P. chinensis*; purple and yellow *Lychnis fimbriata*; white star-like *Stellaria paniculata*; purple *Geranium divaricatum*; yellow lucern, *Mendicago falcata*, and senna, *Colutea nepalensis*; bright yellow *Caragana brevispina*; lilac and yellow *Astragalus chlorostachys*; red vetch, *Vicia rigidula*; bright yellow *Geum elatum*; yellow saxifrage, *S. filicaulis*, and the pink *S. ciliata*; lilac willow-herb, *Epilobium brevifolium*; small white *Circœa cordata*, and the handsome yellow *Morina Coulteriana*. Two species of aster are found with purple ray flowers and yellow discs, *A. molluscellus* and *A. asperulus*; yellow elecampane, *Inula cuspidata*; pink milfoil, *Achillea millefolium*; yellow *Senecio gracilifloruus*, and many purple and lilac thistles, *Echinops cornigerus* and *E. niveus*, *Arctium Lappa*, *Cnicus arvensis*, and *Serratula pallida*. The pretty *Prenanthes violæfolia* flowers late, also the white *Monotropa uniflora*; blue gentians are common from July onwards, *G. capitata*, *G. contorta*, and *G. Kurroo*, also the pale blue halenia, *H. elliptica*, and *Paracaryum glochidiatum*. The blue and yellow forget-me-not, *Myosotis cæspitosa*, is found everywhere and the forest variety, *M. sylvatica*, is found in the woods from 6,000 to 9,000 feet height; pale purple yellow-tinged nightshade, *Atropa belladonna* and yellow purple-veined henbane, *Hyoscyamus niger*, are frequently met with. Also pink and white polygonums of many species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

At lower elevations during the early Autumn are found the white anemone flowers, *A. polyanthes*; yellow buttercups, *Ranunculus diffusus*; white honey-lotus, *Melilotus alba*; the handsome light yellow *Lespedeza juncea*; yellow purple-lined *Æschynomene indica* and bluish *Smithia ciliata*; purple *Uraria neglecta*; pink *Desmodum podœarpum*; pink and red *Vigna vexillata*; yellow *Atylosia platycarpa*; yellow purple-veined *Rhynchosia himalensis*, and pink or white *Flemingia fruticulosa*; white sundew, *Drosera lunata*; purple or white *Erigeron*; the strongscented yellow *Carpesium abrotanoides* used to dye silk; the bur-marigold, *Bidens pilosa*; yellow and purple wormwood, *Artemisia Absinthium*; blue *Mazus rugosus*; yellow *Sopubia trifida*; pink *Amphicome arguta*; green and purple *Achyranthes aspera*; blue *Strobilanthes glutinosus*, and red-purple *Justicia pubigera*.

No mention can be made of the flora of Kashmir without including the trees, the finest of them is the *chenar* plane, *Platanus orientalis*, which attains a great height and girth; it was introduced by the Emperor Jehangir from Persia early in the Seventeenth century and is now to be found all over the valley; it buds in April, blooms in May, and in October the five-pointed leaves turn from green to the richest red and yellow colours. The walnut, *Juglans regia*, is also a splendid tree, the green flower appearing in May, and the two-valved nut ripening in September. The box tree, *Buxus sempervirens*, is found at a height of about 6,000 feet in cold damp glens facing the north; its yellow-green flowers are to be seen in April and the small seeds in October. The *deodar*, *Cedrus deodara*, a variety of the cedar of Lebanon; the common pine, *Pinus longifolia*; the horsechestnut, *Æsculus indica*; the hawthorn, *Cratægus oxyacantha*, and the bay-tree, *Daphne oleoides*, range from 5,000 to 7,000 feet; above them the blue pine, *Pinus excelsa*; silver fir, *Picea morinda*, and at 10,500 feet, the very top of the forests, *Abies Webbiana*, the dark foliage of which gives the name *Kala ban*, black forest, to the neighbourhood, and among these trees is found the white barked *birch*, *Betula utilis*. The common ivy, *Hedera helix* is found above 6,000 feet; its autumn greenish flower and winter black yellow and red berries make it quite a feature of the woods in those seasons. There are 10 genera of ferns and about 80 species to be found commonly in the valley, a complete list of which was included in a little book called "Hints on travelling in Kashmir," published by the Pioneer Press, Allahabad, that in addition gives much useful advice for visitors to the State.

Kashmir is considered a place where a summer can be pleasantly spent in shooting, painting its lovely scenery, or playing polo and the fascinating game of golf, but the varied richly-coloured wild flowers are also a great attraction, though one is no botanist, and its geological features are full of interest even for an amateur in the science.

J. H. A. IVENS.

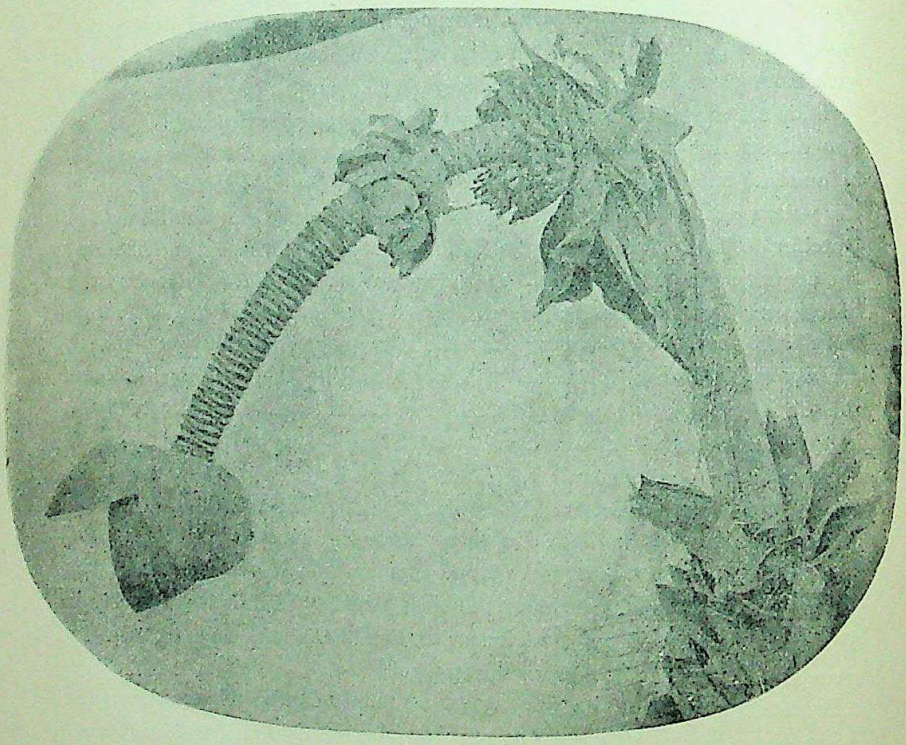
23rd September 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. L.—SECOND YEAR'S GROWTH OF A PLANTAIN INFLORESCENCE.

The accompanying photograph is of a specimen of the wild plantain, *Musa superba*, at present in the garden of the bungalow, 3, Ganeshkhind Road, Poona. The plant in question was put in the ground as a sucker in 1908. In the rains of 1910 it produced its inflorescence and formed several small fruits. Then it remained dormant until the rains of 1911 when the inflorescence again started into growth and has not yet ceased to grow. No leaves, however, were produced this year, all growth being in the inflorescence. The bracts which have been formed this year contained, as far as I have observed, only staminate flowers with rudimentary ovaries—the normal condition of flowers at the tip of the flowering shoot of the plantain.



Plantain inflorescence (Burns).

The measurements of the plant are as follows:—Diameter of stump, 40 cm. Height of stump, 55 cm. Length between top of stump and bunch of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1910 fruits, 40 cm. Growth beyond this produced in 1910, 19 cm. Growth produced in 1911 (to base of bud), 38 cm. Present length of terminal bud, 14 cm.

I have seen a similar case in a wild plantain in the Botanical Garden, Bassein, and should like to know if it is at all common in wild plantains, and if it has been observed in cultivated plantains.

W. BURNS,
Economic Botanist, Poona.

AGRICULTURAL COLLEGE,
POONA, 21*st September* 1911.

No. LI.—A FLY TRAP (*BOUCEROSIA CRENULATA*, WIGHT & ARN.).

On 4th November 1911, I came across a flowering specimen of the Asclepiad plant, *Boucerosia crenulata*, which had successfully entrapped a common fly in the corolla of one of its flowers. The fly was very firmly held, whether by the hairs of the surface or partly by the natural viscosity of the flowers of this order I am uncertain, but I think by the former, for on arrival at home after a long walk I released the captive which flew away quite happily. I send you this note as I have not seen the sensitiveness of this genus recorded anywhere and do not know whether it is usual or not.

PYAWBE, 8*th December* 1911. F. E. W. VENNING, CAPT.

No. LII.—NOTE ON *MACROCHLAMYS* (*EURYCHLAMYS*) *PLATYCHLAMYS* (BLANFORD), ETC.

[*From the* 'PROCEEDINGS OF THE MALACOLOGICAL SOCIETY,' Vol. IX, Part V, June, 1911.]

It has been suggested that the following notes on the habits of this small mollusc, made by me in Bombay about 1898, may be of interest. The animal is of a bluish colour, the horn on the mucous pore is wel marked, and the mantle has two broad shell-polishing lobes, each about a quarter of an inch long, one protruding backwards and the other forwards, over the shells.

It is most lively in very damp weather, and crawls at an astonishing pace, but if allowed to get dry, when in captivity, dies immediately. It is distinctly carnivorous; a *Succinea*, crushed by accident in its presence, was devoured on the spot.

Ariophanta bajadera (Pfeiffer), a much larger species, was attacked while crawling on my table. The *Macrochlamys* climbed on to its shell and bit it savagely on the back. The *Ariophanta* got rid of its assailant by swinging its shell from side to side. On one occasion a specimen hung from my finger by a thread of mucous 3 inches long; at this point I unfortunately

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

let him touch the ground, so did not discover how much longer he migh have made his thread.

Macrochlamys pedina (Bens.), one of the commonest Bombay snails, is also carnivorous. I have seen them engaged in a cannibal feast over dead comrades crushed in the road, and have also seen one busy on the half-emptied shell of *Ariophanta lævipes* (Müll.).

I regret that I did not pursue these investigations further. Specimens of *M. platychlamys* were scarce, and I was more interested at the time in collecting good specimens of the shells than in observing the habits of the beasts.

A. J. PEILE.

No. LIII.—CONCHOLOGICAL NOTES FROM BOMBAY.

By Lionel E. Adams, B.A.

(*Reprinted from the Journal of Conchology.*)

From Durban we went to Bombay, where, from an exclusively conchological point of view, we arrived at the best time of the year to find land and freshwater species, *viz.*, during the South-West Monsoon, when the earth is moistened and pools form. On this occasion the earth was quite sufficiently moistened for my purpose, for during the night of our arrival thirteen inches of rain fell in eleven hours—a record that even Manchester might be proud of. I spent much time in the Natural History Museum, which is an ideal provincial Museum, the exhibits being restricted to the fauna of the country, and arranged on British Museum lines. The collections are copiously labelled, and immaculate as regards dust and mould. I owe much to the Curator, Mr. Kinnear, and the Secretary of the Bombay Natural History Society, Mr. Millard, for the trouble they took to procure me specimens and advise me how to procure others for myself. Acting on their advice, I took a trip up the Ghauts to Igatpuri, where I spent a short but satisfactory time among the snails. It was only possible to hunt between the deluges which continued the whole time with intervals of sometimes half an hour. The most abundant species here was the sinistral *Nanina bajadera*, Pfr., which swarmed along a wall close to the dak bungalow where I was staying. In the town of Bombay, along Malabar Hill, about a quarter of a mile from the sea, in Mr. Millard's garden, were found considerable numbers of one (if not two) species of *Onchidium*, which I regret being still unable to name. *Nanina lævipus*, Müll, and *Macrochlamys pedina* were not uncommon in the same locality, and one species of *Ampullaria* was plentiful in a certain piece of water.

Snail-hunting in India has distinct drawbacks. In dry weather it is useless, and in wet weather it is sometimes impossible and always uncomfortable.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. LIV.—NOTES ON THE CUTCH AMMONITES.

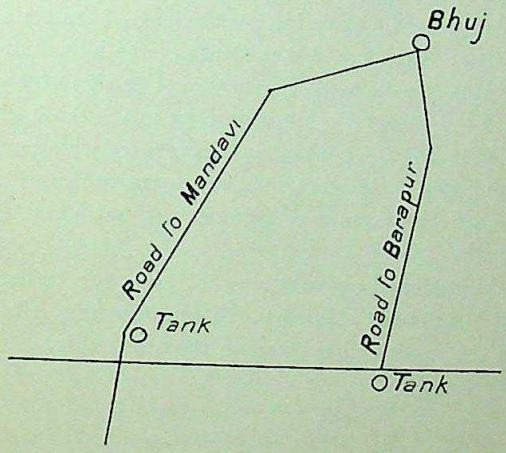
(*With a Plate.*)

About four miles from Bhuj there runs a belt of low hills rich in Belemnites and Ammonites, to say nothing of Terebratulæ, Cardia, Pleurotomariæ et hoc genus omne. This belt extends for over four miles without a break, running generally west to east. It extends further still, after breaks, but for the present article, this section of four miles will be considered.

As you approach Bhuj from Mandvi, at a point six miles from Bhuj, you will find yourself at the top of the pass of the Charwar hills. From its summit, you look down across a broad plain, in the centre of which the Palace tower rises clear and high above the masses of surrounding greenery which ensconce the city. To your right and left runs the long Charwar range in a steady line, golden yellow against the azure sky—with numerous ridges and foothills along the northern base.

A short way down the descent, the road carries you through a cutting and across a bridge. This cutting is the ridge of which I write. In spite of the frowns and gibes of scientific terminologists, I call it the Belteram ridge: why? because it is full of Belemnites, Terebratulæ and Ammonites. It is well worth the close study of a palæontologist.

Now take the following sketch, and you will easily find the limits of my Belteram range. It is indicated by the cross line.



Roughly speaking it has an average width from north to south of 250 yards, but as the strata are tilted at 30° or so, the actual perpendicular thickness of the belt as deposited would be about 600 feet, at each end of the line the belt subsides into the plain to east and west. Nullas which run across its supposed track beyond each end, show no trace of it. It has vanished down below.

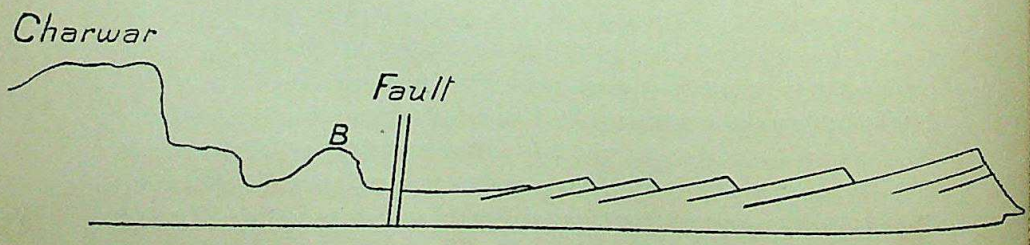
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Now reverse things. Approach the Belteram ridge from the Bhuj side. You go across a fairly level plain, with a few insignificant ridges, dipping slightly south and scarped north. The main substance of the ground, as shown by nullas, is a friable coarse white sandstone, but the surface is mostly of yellow or of red, being littered with small smooth stones (not water worn) or levelled by rain and cultivation. On ahead of you is the belt of the Charwar range (Kir-giri the Cutchis used to call it in this part of its length), rising to 400 or 500 feet over the plain. Lines of dunes and ridges fringe its northern base. The Charwar range is mainly of yellowish shale; but in parts masses of whitish and purplish and blackened sandstone form its upper main strata. The foothills too are mainly of shale; but the first big ridge you come to (ignore the broken belt of black and white sandstone for the present) is of a warm old-gold colour—a soft golden yellow, here and there blackened by exposure. This is our Belteram.

Blanford suggested a fault all along this line, and Wynne and Fedden verified it. The white sandstone of the plain is believed to belong to an Upper Jurrassic age: the Belteram and its backing hills to a Lower Jurassic. That is to say, if the theory is correct, the white sandstone rocks of the plain were at one time much higher than the tops of the 400 feet high hills beyond, but by reason of the Titanic motions of the earth's crust in prehistoric days, either the upper strata have here sunk or the lower strata have been raised. That this change should have been effected by a convulsion I think is hardly probable, for the level of the plain is so smooth, its exposed reefs so regular, and the strata of the hills and ridges to the south of the fault are so even that there is no sign of a great convulsion. I see that the survey reports the rocks to the south of the fault to be much contorted; but the contortions have mainly assumed the regular form which I am going to describe. To my untrained mind the subsidence or elevation was probably gradual. But it was not a matter of 400 feet only.

The plain as mentioned above shows ridges, each riding on the back of its northern forerunner. Going north you pass ridge after ridge, each sloping up from the south and scarped on the north side.



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

These little ridges are of highly coloured sandstone, and further north beyond Bhuj develop into shale, forming the cliffs of the deep Kari River nulla, and the Dhonsar hills beyond, *i.e.*, 8 miles north. Beyond Dhonsar there outcrops again the warm yellow belt of Belteram. The thickness of shale and sandstone between the belts has been adjudged to be 3,000 feet. So if this fault theory is correct (and it seems very probably so) we must allow for a slip of 3,000 feet. Probably in those far-off days, the Ammonites and their kin thought nothing of a subsidence of 1,000 yards. I may say that Wynne and Fedden found these belteram beds to be the lowest exposed rocks of Cutch. They occur again north of Dhonsar, also along the north coast of Cutch, and again in the Runn islands.

To my mind (which is, I admit, amateurish, though keen) there are several puzzles in the theory, *e. g.*, one is this: if the white sandstone represents the higher strata, how is it that one finds a white sandstone hill at the north edge of the fault with a cap of solid belteram rocks. The hill is 50 or 60 feet above the nearest belteram. Again how is it that you find scattered over the surface soil of the plain north of the fault, limestones with terebratulæ, belemnites and sometimes ammonites. These are spread over perhaps half a mile of the plain (northwards). I have found one such limestone within 200 yards of my bungalow, four miles north and one, a mile north of my bungalow. If, after the occurrence of the fault, the sea denuded the north cliffs of the Belteram it may have spread much of the stuff over the plain, but I should not care to have been out sailing in the storm which carried a block of this limestone, weighing about one cwt. a mile north of the ridge.

Again, how is it that if life was so prolific in the age of the deposition of the belteram beds, hardly any life seems to have existed in the centuries during which several hundred feet of shale and sandstone were being deposited above it, and yet a few ammonites have, it seems, been found on the summit of the Charwar hills. I found one forlorn belemnite near the top of the highest hill of the range; poor fellow; he can have had no club to go to; and I don't see how it is that if one belemnite could be preserved by the nature of the ooze in which he died, several of his fellows couldn't be preserved too.

If the life of the Belteram period died out with the formation of its upper deposits, how could the race of ammonites be preserved for the deposits which were formed so much later. The shale and hard limestone slabs which succeeded the Belteram period seem to lie conformably on the Belteram, *i.e.*, they were deposited at the bottom of their sea in unbroken succession to the Belteram strata. As you passed through the pass of the Charwar range, you could have seen its shaly and limestone strata all dipping south at about 28°, which corresponds to the dip of the Belteram beds just below there.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I have examined the Belteram with what an untrained eye considers to be considerable care. It is not all a case of south dip and north scarp, the latter overhanging the plain. There was a regular range of long narrow round topped hills; the north slope of the anticline has gone in some places, but in others its traces are visible, so that here and there the dip of the Belteram nearest to the plain is to the north. Unfortunately at the points where the white sandstone comes visibly in contact with the Belteram, the former is so powdered and broken and fragments of both kinds seem so mixed that one can't see exactly what happens when the two dips come into conflict. In places high masses of brecciated alluvium cap the sandstone, as if washed down from the Belteram ridge by the flow of a sea or river and deposited over the sea's white sandy bed.

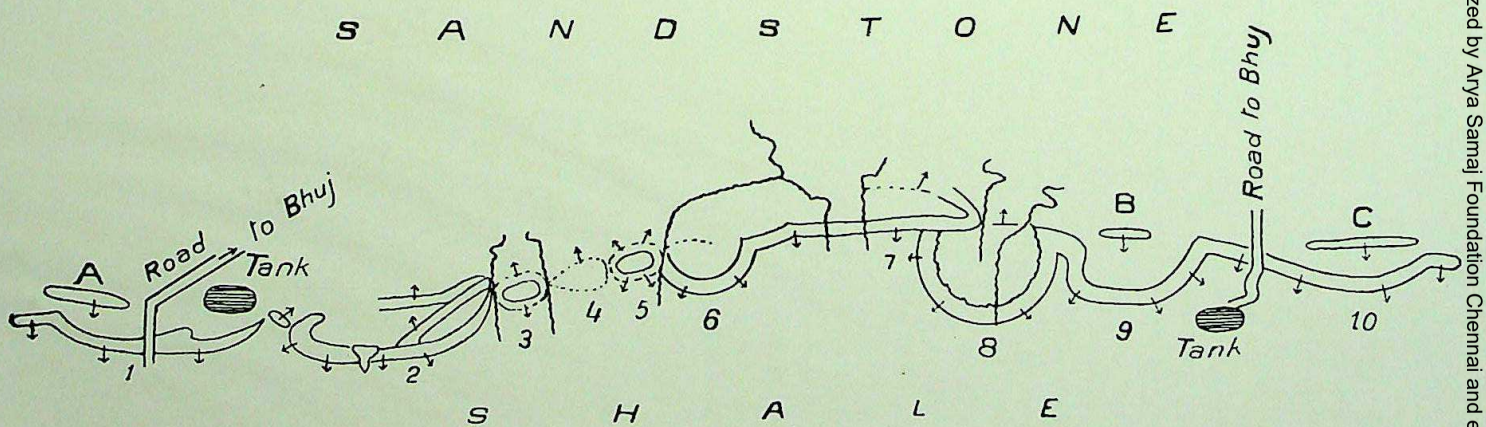
Beginning from the uprise of the Belteram at its west extremity, I find the belt pretty wide here, dipping south and scarped north, with a vanguard ridge of detached dark crimson hills some 200 yards in front of its slope. This vanguard ridge dips deep south and evidently underruns the main belteram beds. It too is of Belteram—but of a harder and coarser material, with fewer fossils in evidence. The plain comes up to the foot of the scarp of the vanguard, and I can trace no sign of my supposed anticline, though the debris on the plain extends some way. Perhaps this anticlinal hill was broken clean in half by the fault.

To the east of Wala Khawas Tank, the belteram shows a long elliptical hill with a west dip of strata on its west flank, north dip on its north and south dip on its south. All the centre has been eroded; and the west and north sides of the anticline have been eaten away and reduced much more than the high south ridge.

Beyond a nulla, I find another circular hill, dipping outwards on all sides, also eroded in the centre. Then a long mound, probably the relics of another round hill quite eroded, leads up to another circular hill, whose strata dip outwards on all sides. A deep nulla defines its eastern slope and a fourth circular hill supervenes, its north side mostly vanished. Then a long ridge, the south side of a quondam elliptical hill, for after travelling along the ridge for 1,000 yards, I note a slight outcrop, 150 yards to the north, of belteram dipping north and gradually rising and curving in to join my ridge, and beyond its junction the strata dips round eastwards. Here it is that just to the north of the fault lies the broad squat hill—60 feet high—of white sandstone carrying its cap of belteram.

But a peculiar sight to the south of this point is a great bowl 600 yards across, its sides made of yellow belteram ridges. The bowl is like its name, its ragged and jagged and jutting edges rising some 20 or 50 feet all round, all dipping outwards. Even the north side of it dips outwards, its strata clashing with those of the main ridge which we have been following. Evidently it was once a great cone of belteram—now all eroded—and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



NOTES ON CUTCH AMMONITES.

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

its soft yellow rocks melting year by year, their square broken debris lying tumbled round the sides of the bowl. A stream, dry most of the year, drains it and carries off the melted ingredients to feed the plain beyond.

I continue along my ridge, and come to a great semi-circle, sweeping round by the south, all scarped on its more northerly side, with tumbled debris, all its sides dipping outwards—apparently another quondam conical hill. The semi-circle is 800 yards in diameter. The north side of the old cone is clean gone; but standing out in front to shelter the hollowed line is another vanguard hill dipping deep south, just like the first vanguard hill did. This vanguard hill again is of harder and coarser texture and preserves its fossils tightly; much of it is of volite with minute molluscs engrained.

I cross the semi-circle and pick up my ridge again and continue across the Barapur Road; but here again rises a third vanguard hill, protecting a southerly curve of the main ridge. It is of the same material and ill preserved fossils as its vanguard predecessors. This vanguard and the line of the ridge behind curve on to a point some 800 yards on, and then both sink away, vanguard and main body, and subside under the plain of shale and sandstone. A nulla a little way on shows no trace of belteram; in its walls one sees the shale of the south and the white sandstone of the north brought into summary contact; the shale has come off worst; its proud thin lines of serried strata are here crumpled up and precipitated headlong downwards.

I do not know how far geologists have noticed this peculiar chain of rounded hills; I do not see it specially mentioned in the Geological Survey Memoirs, and I have not got Stoliczka's records. But it has seemed to me worth notice, especially as the chain of curves, circles, semi-circles, &c., is composed entirely of belteram, and beyond it to the south, where the harder rocks or the shale overlie the belteram outcrops, you get a cessation, or anyhow a famine, of fossils.

The belteram beds are full of palæontological interest apart from their geological setting. Fossils abound—terebratulæ, small and big; thynconellæ; pleurotomariæ, ostrœa, and many other molluscs; but the ammonites alone are a delight in themselves. I have got from this ridge what I take to be over 40 different species, probably more than 50. I have various species of Phylloceras, of Oppeliæ, of Harpoceras, of Stephanoceras, of Peltoceras, of Aspidoceras, and of Perisphinctes, Haploceras of Amaltheus I have not found. Identification of several species is a difficulty. I believe several to be new to Cutch. Nautilus have also been found.

Dr. Waagen who in 1871 wrote in the Palæontologia Indica (Ser. IX, I, Vol. I, Nos. 1, 2, 3, 4) on the Cutch Ammonites, illustrated and classified the specimens discovered by the Geological Survey; but it seems that he

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

did not himself visit Cutch, and I cannot tell to what zone of palæontology he would have assigned this bed. He speaks of the Anceps beds of Samatra, which is a village at the north foot of the Charwar hills and has probably the same strata as are here exposed; but I have found only one Anceps here. I am inclined to think he would more probably have classed it as Dhosa Oolite, Asp. babeanum is so fairly frequent. I should be glad to get into communication with some member of the B. N. H. S. who is keen on these matters and who can criticise and correct my errors, and will assist in the identification of the more doubtful specimens.

AMMONITES, &c., FOUND IN THE ABOVE BELT.

Nautilus—
- kumagunensis.
- kutchensis (?)

Phylloceras—
- disputabile.
- lodaiense.
- mediterraneum.

Oppelia—
- bicostata. (?)
- orientalis.
- kutchensis.
- trachynota.

Aptychus of oppelia.

Harpoceras—
- dynastes.
- trilineatum.
- hecticum. (?)

Peltoceras—
- athleta.
- (indeterminate).

Aspidoceras—
- diversiforme.
- pondesosum.
- babeanum (frequent)
- sub-distractum. (?)
- wynnei. (?)

Stephanoceras—
- macrocephalum. (?)
- polyphemus.
- maya.
- tumidum.
- fissum. (?)
- transiens.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Perisphinctes—

paramorphus. (?)
pottingeri.
katrolensis.
torquatus.
bathyplocus.
frequens. (?)
virguloides.
martelli.
anceps.
alterneplicatus.
dhosænsis.
omphalodes.

Also some 7 or 8 other sorts which I cannot identify with any in Waagen's catalogue. The specimens being in many cases fragmentary or not showing lobes, I may have mistaken several of the above.

J. H. SMITH.

BHUJ, CUTCH, *December* 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PROCEEDINGS.

A meeting of the members of the Bombay Natural History Society took place on Thursday, 25th January 1912, at the Society's rooms, Mr. E. Comber presiding.

The election of the following 69 new members since the last meeting was duly announced :—

The Mess President, 2nd N. Staffordshire Regiment (Peshawar); Mr. C. C. Gilbert (Ratnapura, Ceylon); Lt. S. G. G. Fraser (Bangalore); Mr. J. F. B. Hartshorne, I.C.S. (Ahmedabad); Mr. W. T. Radford (Shahabad, Bengal); Mr. J. R. Coats, B. Sc., A.M.I.C.E. (Madras); Mr. R. T. Jones (Ferozepore); Staff-Surgeon R. B. Scribner, R. N., H. M. S. Alert (Persian Gulf); Lt. C. R. S. Pitman (Alipur); Mr. H. L. Wintle (Darjeeling); Mrs. W. H. Ogston (Bombay); Mr. Ashton James (Bijapur); Mr. W. H. Reed (Kadur District); Mr. R. R. Morgan (Tezpur, Assam); the Honorary Secretary, Club Library (Secunderabad); Major H. H. Norman, R.A.M.C., Shwebo (Burma); Mr. A. A. Biggs (Marmagoa); Mr. R. Dupont (Seychelles); Capt. B. N. Abbey (Burma); Capt. G. R. Balston, R. H. A. (Mhow, C. I.); the Secretary, Australian Museum (Sydney) Lt.-Col. C. E. Nichol, D.S.O., R.A.M.C. (Maymyo, Burma); Lt. A. D. Talbot (Multan, Punjab); Major W. B. Pearson (Multan, Punjab); Mr. A. L. Hannay, I.C.S. (Waltair, S. I.); Mr. A. H. Duke (Bangkok, Siam); Mr. L. D. G. Smyth (Katha District, Upper Burma); Mr. Basant Lal Gupta, B. Sc. (Lucknow); Lt. W. A. Nicholls, R.H.A. (Campbellpore); Mr. B. F. Cavanagh (Baroda); the Honorary Librarian Public Library, Lucknow; Mr. W. Denso (Bombay); Mr. W. P. Hulton (Gangarpur); Mr. M. Mackertich (Gulzarbagh); Capt. E. C. Taylor, I.M.S., Parachinar, N.W.F.P.; the Mess President, XI K. E. O. Lancers (Delhi); Mr. E. R. Atkins (Baheng, Siam); Mr. D. B. Binning (Bombay); Mr. H. A. Gilbert (Bombay); Mr. C. Gwyer, I.F.S. (Thayetmyo, L. Burma); Major R. Sparrow (Trimulgherry, Deccan); Mr. F. H. S. Stone (P. & O. S. N. Coy).; Mr. C. I. Hutton (Ywataung, Upper Burma); Mess President, 1st Battalion, the Royal Scots (Allahabad); Mess President, 62nd Punjabis (Benares); Mr. R. G. Marriott, I.F.S. (Haldwani, U. P.); Capt. G. R. Bird (Berbera, Somaliland); Mr. H. G. Turner (Taunton, England); Mr. A. C. Gale (Dharwar); Mr. L. E. Taylor (Dharwar); the Mess President, 7th Hussars (Bangalore); Mr. G. A. Skene (Thayetmyo, Burma); Capt. Sir G. D. S. Dunbar, Bart. (Lakhimpur, Assam); Mr. John Curror, Langla (S. Sylhet); Mr C. H. Haldane (Mandalay); Lt. W. Weatherbe (Agra); Mr. L. C. Hobson (Dharwar); Mr. Geo. H. Ogilvie (Bavaria); Mr. W. K. Webb (Nagri Spur P. O.); Mr. W. L. Travers (Jalpaiguri); Mr. E. C. Gibson, I.C.S. (Saugor); Mr. M. R. G. Smith (Dharwar); Lt. W. A. P. Grey (Sagaing, Burma); Mr. A. Davison, P.W.D. (Raipur); Lt. J. E. M. Mellor (Amballa); Mr. Phirozsha Bomanji

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Petit (Bombay); Mr. B. M. Crosthwaite (Ywataung, U. Burma); Mr. G. Macphail (Ireland) and Mr. C. Christie (Madras).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contributions.	Locality.	Donor.
1 Gayal or Mithan, entire skin with head and horns.	Mishmi Expedition.	Capt. F. M. Bailey.
Skull and Horns of Hodgson's Sheep.	Himalayas ..	Mr. A. Wright.
Horns of Black-buck	Dholka	Justice N. C. Macleod.
2 skins with skulls and 1 Mask of Tibetan Wolf.	Lahul, Kangra ..	General W. Osborn.
1 Jackal	Dharwar	Mr. E. G. L. Laird MacGregor, I.C.S.
1 Jungle Cat	Shamshirnagar ..	Mr. G. Macrell.
1 Large Flying Squirrel	Taungyi, S. Shan States.	Mr. S. St. C. Lightfoot.
1 Large Malay Squirrel	Kobo, Abor Expedition.	Major Sweet.
Do. do.	Dosing Valley, Abor Expedition.	Dr. J. Falkiner.
4 Squirrels and 17 Bird skins ..	Mishmi Hills ..	Capt. F. M. Bailey.
1 Malabar Spiny Mouse	Mercara, Coorg ..	Mr. A. E. Alexander.
1 Bamboo Rat, melanistic var. ..	Maymyo	Lt.-Col. C. E. Nichol, D.S.O., R.A.M.C.
12 Bats (*spirit sp.*)	Ratnagiri ..	Mr. C. Hardie, I.C.S.
3 Bats (*spirit sp.*)	Almora	Major F. Wall, I.M.S.
2 Flamingoes	Panvel	Mamlatdar of Pen.
1 Mute Swan	Karachi	R. MacCulloch.
1 Great Indian Bustard	Rajkot	Major W. Keys.
1 Wood Snipe	Bangalore ..	Col. R. E. Betham.
1 Large Indian Pratincole ..	Shamshirnagar ..	Mr. G. Macrell.
1 Brown Wren	Bhutan, Doars ..	Mr. H. V. O'Donel.
1 Yellow-eyed Babbler, albino ..	Thayetmyo ..	Mr. J. Pemberton Cook.
8 Birds' skins	Taungyi	Mr. S. St. C. Lightfoot.
13 Birds' skins	Chamba	Capt. J. E. Boyd.
124 Birds' eggs	Khasia Hills ..	Mr. E. C. Stuart Baker, F.Z.S.
10 Fresh water fishes	Koina & Krishna River.	Mr. W. A. Wallinger.
Several Fish and Shrimps ..	Dwarka	Capt. A. H. E. Mosse, I.A.
5 Gold Fish with 3 lobed tail (*alive*).	Shanghai ..	Mr. F. H. S. Stone.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Contributions.	Locality.	Donor.
2 Siamese fighting-fish (*alive*) ..	Siam	Mr. Nigel Kerr.
3 Fresh water fish (*alive*)	Bombay	Do.
1 Sind Krait	Tochi Valley ..	Capt. E. C. Taylor.
1 Russel's Earth Snake	Poona	Capt. A. Delme Radcliffe.
1 Do. do.	Santa Cruz ..	Lt. F. J. Chadwick.
1 Brown Tree Snake (*alive*) ..	Do. ..	Col. J. Forbes.
1 Green Whip Snake (*alive*) ..	Bombay	Rev. F. Dreckmann, S.J.
1 Do. (Brown *var.*)..	Bhutan, Doars ..	Mr. H. V. O'Donel.
25 Snakes	Nelliampatti Hills	Mr. A. M. Kinloch.
14 Snakes and 8 Lizards ..	Various	Major F. Wall, I.M.S.
14 Snakes	Taungyi	Mr. S. St. C. Lightfoot.
1 Cobra	Gaya, Bengal ..	Mr. J. Powell.
1 Cobra (skin 6 ft. 7 in. unskinned)	Shamshirnagar ..	Mr. H. V. O'Donel.
1 Cobra	Do. ..	Do.
1 Russel's Earth Snake	Manmad	Mr. E. Cooke.
1 Common Wolf Snake and 1 Buff Striped Keelback.	Andheri	Mr. F. H. S. Stone.
1 Hypsirhina Sieboldi	Nepal	Mr. F. Field.
1 King Crab	Singapore ..	Mr. F. H. S. Stone.
1 Piece of Gold Quartz	Australia ..	Do.
19 Butterflies	Singapore ..	Mr. P. Gerhardt.
68 Butterflies	Abor Expedition..	Major Sweet.
1 Painted Bat	Thana District ..	Mr. C. E. L. Gilbert.
A number of fossils	Cutch	Mr. J. H. Smith.

The following collection had also been left to the Society by the late Major G. S. Rodon:—

Mounted heads.—1 gaur head: 3 heads of Chamba serow; 3 heads of Himalayan tahr; 3 heads of Nilgiri tahr; 4 heads of goral; 6 heads of chinkara; 9 heads of black buck; 3 heads of Himalayan ibex (two males and 1 female); 1 young female Hodgson's sheep; 2 heads of musk deer; 1 head of sambar; 1 head of nilgai; 1 head of Himalayan brown bear; 1 head of Himalayan black bear; 1 head of spotted deer; 1 head of Indian wild boar; 1 head of a langur, and 3 pairs of horns of spotted deer. Entire stuffed specimens:—2 brown bears; 1 wolf; 1 white-handed gibbon; 1 hoolock; 1 jackal; 4 mountain foxes; 1 common Indian fox; 1 pine marten; 2 Ward's mouse hares. Flat skins with stuffed heads:—3 Himalayan brown bears; 1 Himalayan black bear; 1 tiger: 1 fox; 1 langur. Flat skins:—1 spotted deer; 2 Himalayan tahr; 2 serows; 1 black bear; 2 Himalayan ibex; 1 young female Hodgson's sheep; 1 goral; 6 black buck; 3 chinkara; 1 wild dog; 2 musk deer. Birds mounted:—4 monauls; 2 chukor; 3 Koklas pheasants.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Minor contributions had been received from Messrs. E. Pearson, N. B. Kinnear, A. Wright, C. H. Dracott, J. F. Keddie, F. H. S. Stone, C. F. Hall, J. H. Smith, Col. A. Newnham, P. M. D. Sanderson, and W. Michael.

The following additions have been made to the library :—

"Familiar Indian Flowers" (coloured plates) by Lena Lowis (presented by Miss Phipson). "Contributions to Indian Ornithology," No. 1, Cashmere. Ladak, Yarkand, by Hume (presented by Lt.-Col. A. Newnham). "Notes on Jerdon's Mammals of India," Anon, (presented by Lt.-Col. A. Newnham).

NEW MEMBERS REQUIRED.

The Secretary mentioned that at the present moment the Society only had about 150 members in Bombay out of a total of 1,500 members. He thought this number was considerably less than formerly and hoped that local members as well as up-country ones would try and induce others to join the Society. The annual subscription of Rs. 15 was smaller than any other Society he knew when one compared the value of the Journal which members received, the Society's various collections of specimens in the Museum, and the library which contained many valuable books of reference. The subscription had not been increased for 25 years, although the Journal was now four times as large.

MAMMAL SURVEY.

Up to now 767 specimens had been collected by Mr. Crump in Khandesh, Cutch, the Berars and the Central Provinces and 503 specimens collected by Mr. Shortridge (in 2 months) in the Dharwar District. All of these had been forwarded to the British Museum for working out and the first report on them would appear in the next Journal. Some Rs. 23,000 had been collected, but about Rs. 7,000 had already been spent as the initial expenses were necessarily heavy and the Committee hoped that members would continue to support this fund, which was doing such good work. Already one new genus had been found and two new species, the descriptions of which would appear in the Journal.

The following papers were then read :—1. "Some Notes on Guests of Termites," by the Rev. J. Assmuth, S.J. 2. "A Note on *Trichosanthes divica*," by Lt.-Colonel K. R. Kirtikar, I.M.S. (Retd.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CONTENTS OF THIS NUMBER—(*contd.*).

PAGE

SOME BIRDS AND BIRDS' NESTS FROM HAKA, CHIN HILLS. By Capt. F. E. W. Venning 621

A NEW SNAKE *PSAMMOPHIS TRITICEUS*, FROM BALUCHISTAN. By Major F. Wall, I.M.S., C.M.Z.S. 634

DESCRIPTION OF A NEW SPECIES OF *ACMÆA* FROM BOMBAY, AND NOTES ON OTHER FORMS FROM THAT LOCALITY. By Edgar A. Smith, I.S.O. 637

PROGRESS OF THE MAMMAL SURVEY. (*With a Plate*). 640

REVIEWS. "Forty years among the Wild Animals of India" and "Medical Entomology" 645

OBITUARY NOTICE. E. W. Oates 651

MISCELLANEOUS NOTES:—

I.—The number of cubs in a tiger's litter. By C. R. S. Pitman 653

II.—The Stoat in Kashmir. By Major H. A. F. Magrath. 653

III.—A Deformed Thamin Stag (*Cervus eldii*). By A. H. D. Barron 654

IV.— Do. Chinkara (*Gazella bennetti*) drink water? By C. R. S. Pitman 655

V.—Indian Breeds of Sheep. By H. J. Elwes, F.R.S. 655

VI.—The Banting or Tsaing (*Bos sondaicus*). By A. Rodgers 656

VII.—The Colouration of Tigers. By C. R. S. Pitman 657

VIII.—A Deformed Head of the Four-horned Antelope. By C. R. S. Pitman 658

IX.—The Pintail Duck (*Dafila acuta*) shot in September. By Major H. A. F. Magrath 658

X.—Occurrence of European Striated Swallow (*Hirundo rufila*) in Kangra. By H. Whistler 659

XI.—Nidification of Tweeddale's Scimitar Babbler (*Pomatorhinus nuchalis*). By J. P. Cook 659

XII.—The Paradise Flycatcher (*Terpsiphone paradisi*). By Major H. A. F. Magrath 660

XIII.—The Crag Martin (*Ptyonoprogne rupestris*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 660

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

MISCELLANEOUS NOTES—*contd.*

XIV.—Extension of the habitat of the Common Kingfisher (*Alcedo ispida*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 661

XV.—Note on the Common Kingfisher (*Alcedo ispida*). By Major H. A. F. Magrath 661

XVI.—The Notes of Pallas' Fishing Eagle (*Haliaëtus leucoryphus*) and some water birds. By Major H. A. F. Magrath 662

XVII.—Immature plumage of Lammergayer (*Gypaëtus barbatus*). By H. Whistler 663

XVIII.—Occurrence of the Goshawk (*Astur palumbarius*) in Sind. By Raymond W. Cooper 665

XIX.—Extension of the habitat of the Brahminy Kite (*Haliastur indus*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 665

XX.—The Painted Snipe (*Rostratula capensis*). By C. R. S. Pitman 666

XXI.—Painted Snipe (*Rostratula capensis*) in large numbers. By A. H. Kingston 667

XXII.—Record of Snipe shot at Hminelongyee, in the Chiengmai District of Siam, from 1905 to 1910. By D. L. Keddie 667

XXIII.—Notes on some of the bird life at Thandoung. By J. P. Cook 668

XXIV.—Migration of Baya (*Ploceus baya*). By A. B. Punde .. 675

XXV.—The Maroon Oriole (*Oriolus traillii*). By Alex. M. Primrose 676

XXVI.—Wood Snipe (*Gallinago nemoricola*) occurring near Bangalore. By Lieut.-Col. R. M. Betham 677

XXVII.—Goose-shooting in Cutch. By Maharaj Kumar Shri Vijayarajji 678

XXVIII.—Falcons and their prey. By Lt.-Col. S. E. Prall, I.M.S. 680

XXIX.—On the occurrence of the Common Wood Shrike (*Tephrodornis pondicerianus*) and the Central Asian Black Bird (*Merula maxima*) near Peshawar. By Major H. A. F. Magrath 680

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CONTENTS OF THIS NUMBER—(*contd.*).

PAGE

MISCELLANEOUS NOTES—*contd.*

XXX.—Habits, food and nesting of the Great Himalayan Barbet (*Megalæma marshallorum*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 681

XXXI.—Marbled Duck at Baroda. By Lt.-Col. R. G. Burton 684

XXXII.—The Sooty Tern (*Sterna fuliginosa*) in Cachar. By E. C. Stuart Baker, F.Z.S., F.L.S. 684

XXXIII.—Notes on the Southern Migration of Snipe near Calcutta, 1911. By C. R. S. Pitman 684

XXXIV.—Occurrence of the Nukhta or Comb-duck (*Sarcidiornis melanonota*) in Sind. By M. Webb, I.C.S. 685

XXXV.—The breeding of the false Himalayan Viper (*Psammodynastes pulverulentus*). By Major F. Wall, I.M.S., C.M.Z.S. 686

XXXVI.—Food of the Snake *Rhabdops bicolor*. By Major F. Wall, I.M.S., C.M.Z.S. 687

XXXVII.—The Diet of a Bull-frog (*Rana tigrina*). By S. P. Agharkar 687

XXXVIII.—Notes on the Indian Chamæleon (*Chamæleon calcaratus*). By C. Chenevix Trench, I.C.S. 687

XXXIX.—Snake eating a Snipe. By Capt. F. E. W. Venning.. 689

XL.—Some notes on the hatching of the Agamoid Lizard (*Calotes jerdoni*). By Capt. F. E. W. Venning 690

XLI.—Breeding of Macclelland's Coral Snake (*Callophis macclellandi*). By Major F. Wall, I.M.S., C.M.Z.S 693

XLII.—The Madras Aquarium. By Dr. N. Annandale 693

XLIII.—The Life of a Dog Tick. By Capt. W. J. Massy 694

XLIV.—Asilid Oviposition. By S. K. Sen 695

XLV.—Caterpillar Pest on Cotton in Khandesh. By R. S. Kasargode 698

XLVI.—Note on the Butterflies, *Lethe kansa* and *Dophla patala*. By G. W. V. DeRhé-Philipe, F.E.S. 698

XLVII.—*Papilio polytes* in Bangalore. By K. Kunhi Kannan.. 699

XLVIII.—A Note on *Trichosanthes divica*, Roxb. By Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.) 700

XLIX.—Notes on the Flora of the Vale of Kashmir. By J. H. A. Ivens 701

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

1012
1024

Digitized by Arya Samaj Foundation Chennai and eGangotri

JOURNAL
OF THE
Bombay Natural History Society.

JULY 1912. VOL. XXI. No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART VII.

With Plates VII and A & B.

(Continued from page 337 of this Volume.)

Genus—*SYPHEOTIS.*

The principal generic distinction between the birds of this genus and other Bustards is the greater comparative length of the legs. The tarsus in *Sypheotis* is equal to rather more than ⅓rd the length of the wing, whereas in all other Bustards it is only equal to ¼th. The chief generic characteristic relied on by Blanford is the supposed fact of the males putting on a seasonal breeding plumage. It, however, now seems quite certain that the male *Sypheotis bengalensis* retains this adult plumage, when once fully acquired, throughout the year, though the smaller bird, *Sypheotis aurita*, does, on the contrary, acquire an annual nuptial plumage. The primary quills of both species are notched on the inner web and are very attenuated, but especially so in *aurita*.

In the breeding season the males of both species, and during the whole year the fully adult males of *Sypheotis bengalensis*, have the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

head and the whole of the lower parts black and both species acquire ornamental plumage either on the head or neck. *Sypheotis bengalensis* is crested and has long, full feathers all down the neck to the breast, whilst *Sypheotis aurita* has the feathers of the side of the head and chin somewhat lanceolate and lengthened, and a curious tuft of long feathers from each side of the head below the ear coverts, the longest of which have the stems narrowly webbed and the ends spatulate.

Sharpe divides *Sypheotis* into two genera, creating a new genus *Houbaropsis* for the larger bird and retaining *Sypheotis* for the smaller. The fact of the latter having a seasonal change of plumage and the former not having one would add considerable strength to the reasons for dividing them, but for the purpose of this work I retain them in the one genus.

KEY TO THE SPECIES.

Wing 7″ to 10″; tarsus 3·35″ to 4·5″ ... *S. aurita.*
Wing 13″ to 15″; tarsus 5″ to 6·2″ ... *S. bengalensis.*

SYPHEOTIS AURITA.

The Lesser Florican or Likh.

? *Otis indica.*—Gm. Syst. Nat. i, p. 725; Lath. Ind. Orn. ii, p. 661; Oates. Cat. Eggs B. M. ii, p. 87; Sharpe Hand-l. i, p. 175.

Otis aurita.—Lath. Ind. Orn. ii, p. 660.

Otis marmorata.—Gray and Hardw. Ill. In. Orn. 1, pl. 60.

Sypheotides aurita.—Less. Rev. Zool., 1839, p. 47; Blyth, Cat. B. Mus. As. Soc., p. 259; Jerdon, B. of Ind. iii, p. 619; King, J. A. S. B. xxxvii, part 2, p. 216; MacMaster, *ibid*, xl, part 2, p. 215; Stoliczka, *ibid*, xii, part 2, p. 250; Gould, B. of Asia, vii, pl. 57; Hume, Str. Feath. i, p. 136, 228; Adam, *ibid*, p. 393; *id*, *ibid*, ii, p. 339; Ball, *ibid*, p. 428; LeMess, *ibid*, iii, p. 379; Blyth, B. of Burm., p. 152; Butler, Str. Feath. iv, p. 10; Fairb., *ibid*, p. 262, 266; Butler, *ibid*, v, p. 231; Ball, *ibid*, p. 419; Hume and Marsh., Game B. i, p. 34; iii, p. 425; Hume, Cat. No. 839; *id*, Str. Feath. viii, p. 111; MacInroy, *ibid*, p. 491; Butler, Cat. Bird. of Sind, etc., p. 56; *id*, Cat. B. S. Bom. Pres.,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

p. 71; Vidal, Str. Feath. ix., p. 77; Davidson, *ibid*, x., p. 318; Hume, *ibid*, p. 412; Barnes, B. of Bom., p. 322; Murray Vert. Zool. Sind, p. 220; Barnes Jour., B. N. H. Soc. i, p. 57; *id*, *ibid*, vi, p. 13; Laurie, *ibid*, p. 94; Littledale, *ibid*, p. 199; Davidson, *ibid*, xii, p. 64; Dewar, *ibid*, xvi, p. 495.

Eupoditis aurita.—Gray, Cat. Mamm., etc., Nepal Cres. Hodgson, p. 130; *id*, Hand-b. B., iii, p. 9.

Sypheotis aurita.—Hume, Nests and Eggs, Ind. B., p. 561; Oates, 2nd Ed., *ibid*, iii, p. 380; Blanford, Avi., B. I., iv., p. 198; Sharpe, Birds of B. M., xxiii, p. 313; *id*, Oates, Game B. of Ind. i, p. 419; Finn, In. Waders, p. 125; Symons, Jour., B. N. H. Soc., xix, p. 261; R. K., *ibid*, p. 995.

Vernacular Names.—Ker-mor, *Guzerat*; Sun-mor, *Deccan and Marathi Districts*; Chini-mor, *Belgaum*; Khartitar, *Bheels*; Likh, Chota Charat, *N.-W. Provinces*; Charas, Chulla Charas, *Southern India*; Kannoul, *Kanarese*; Niala nimili, *Telugu*; Wurragu Koli, *Tamil*; Bursati or Kala Tugder, *Rhotak, Gurgaon.*

Description—Adult Male.—Whole head and neck, including ear plumes glossy black; chin and centre of upper throat pure white. Remainder of underparts black; the breast, like the head and neck, is a deep velvety black, often highly glossed, but the abdomen is less glossy and this and the undertail coverts are sometimes rather dingy and brownish. Below the hind neck and between this and the back there is a broad band of white which descends as far as the upper breast, often encroaching upon it for almost an inch on either side. Upper plumage a sandy buff, each feather with the centre having a spear-shaped black, or brownish black, patch margined with yellowish sandy, the rest of the feather vermiculated with black or brown. On the lower back the vermiculations are less definite and the central marks obsolete, whilst on the central tail coverts their place is taken by definite cross bars of deep brown. Rectrices sandy buff with a rufous tinge, finely vermiculated as on the back and with four definite cross bars of blackish brown. Scapulars like the back but those nearest the shoulder coverts more or less freckled with white. Larger wing coverts black, the hidden portions of the inner webs freckled with white and brown; remaining median and lesser coverts, where visible, white; the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

basal portion of the secondary coverts freckled with brown and a few coverts next the inner secondaries approximating these in colouration, but retaining a great deal of white. First two, three, or in some cases four outermost primaries uniform brown; the remainder with broad bars of rufous buff, these widening towards the secondaries. Outer secondaries mottled brown and buff, sparsely freckled with white at the tips, inner secondaries like the back but with white freckling on the edges near the coverts and with the smallest feathers next the scapulars marked with rufous buff.

The feathers of the upper throat are lengthened, those behind the ear coverts being greatly so, the three longest sometimes reaching as much as 5″ in length and generally exceeding 3½″. As a rule the three longest feathers are graduated, and though in some cases they are sub-equal, there is nearly always a great difference in length between these three feathers and the others which may vary between 1″ and 2″. These feathers, more especially the longer ones, are spatulate in shape.

Wing 7·1″ to 8·05″; tarsus 3·35″ to 3·75″; bill at front 1·25″ to 1·5″; tail 3·25″ to 4·5″.

"The irides are dull yellow, sometimes very pale, sometimes brownish; the legs pale, somewhat fleshy yellow, sometimes hoary, sometimes more dusky; the bill is pale yellow, somewhat fleshy towards gape, the ridge, tip and more or less of the upper surface shaded with dusky heavy brown." (Hume).

"Length 17·25″ tc 19″; expanse 27·5 to 32; wing (to end of longest primary) 7·3 to 7·9; tail 4·1 to 4·5; tarsus 3·65 to 3·9; bill from gape 2·0 to 2·1. Weight 14 ozs. to 1 lb. 4 ozs." (Hume.)

"Total length 15 inches, culmen 1·5, wing 7·9, tail 3·5, tarsus 3·5. (Sharpe).

From the above measurements it will be seen that this Bustard varies very considerably in size, but the measurements first given include those of the whole of the British Museum series (some 85 birds), as well as many others which have passed through my hands, so may be taken as shewing fairly satisfactorily the range of variation. The only bird of the British Musem series omitted from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the above measurements is an abnormally small bird with a wing of only 6·85″. It may be noticed that I have not given measurements either of length or expanse in describing this or any other bird, but I have omitted these measurements intentionally as they depend far too much upon every individual sportsman's way of measuring and the extent to which wings and neck are stretched during the operation.

Adult female.—Forehead, crown and occiput black, the feathers more or less tipped with buff and the inner webs of the central feathers also buff, forming a well defined mesial streak; lores, fairly well defined supercilium and post orbital region buff with a few black specks and a line of black specks running under the eye; sides of head and ear coverts buff, immaculate or with a few fine specks only; chin, throat and sometimes the region below the ear coverts white. Posterior aspect of the neck buff, finely vermiculated with black, or dark brown, anterior aspect buff, with broad splashes of black forming two broad streaks down to the breast; sides of the neck next the shoulders with similar streaks; breast buff with bold black markings and freckles, the latter often forming crescentic marks. Remainder of lower parts buff, often almost white, the flanks more or less freckled and barred with blackish and the innermost axillaries black.

Back, scapulars, rump and upper tail coverts buff, each feather with a broad central spear head of black, surrounded with buff. These marks disappear on the rump which is more indefinitely marked. Tail, like the back but without the spear head marks and with four broad bands of black. Quills of the wing as in the male. Wing coverts buff, the outer sparsely barred with brown or black, the inner and smaller profusely barred and to some extent freckled with black.

Wing 8·25″ to 9·75″; tarsus 3·55″ to 3·85″; bill at front 1·45″ to 1·65″; tail about 4·5″.

"*Female.*—Length 18 to 21·4; expanse 29 to 36; wing 9·0 to 9·75; tail 4·7 to 5·0; tarsus 3·9 to 4·4; bill from gape 2·28 to 2·3. Weight 1 lb. 2 ozs. to 1 lb. 10 ozs." (Hume).

There are several females in the British Museum collection with wing under 9″, but these are probably young birds. Fully adult

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

birds, *i.e.*, over 18 months, will not often be found with a wing of less than 9".

Inglis sends me a note on the soft parts of a female shot by him in Behar as follows: "Bill dusky red, culmen dark brown, gape and base of lower mandible yellow; *iris* yellow tinged with red; legs dull dusky yellow."

Adult male in winter plumage.—Similar to the female, but retaining a considerable amount of white on the wing.

Young male.—Like the female.

Nestling.—"An almost uniform dirty pale yellow colour, with an unclosed V (*i.e.* ν) on the crown of the head in dingy black, and blotches, rather stripy, of black on the wing, back and sides, and about the ears; legs and beak a colour between pale blue and pale pink; and on the tip of the beak a little lump of pale pearly white." (Davidson as quoted by Hume.)

Distribution.—In "Game Birds" Hume thus describes the habitat of the Lesser Florican :—

"I find great difficulty in defining the limits within which the Lesser Florican occurs; firstly, because it is irregularly migratory and secondly because individual birds straggle in the most unaccountable manner hundreds of miles beyond the furthest districts which it at all regularly visits."

"Dr. Jerdon tells us that 'this species is found throughout India, from near the foot of the Himalayas to the southermost districts,' but this conveys, I think, a somewhat erroneous idea of its distribution, which is not nearly so wide as this might seem to imply."

"Although a certain number are probably permanent residents of Khandesh, Nasik and Ahmednagar, the real home of the Lesser Florican is in the drier portions of the Peninsula, lying east of the Western Ghats and south and east of the Godavari."

"It is, of course, confined to plains and open country, and does not ascend any of the hills, though a single specimen was once killed, I hear, on the slopes of the Nilgiris, between Neddiwattum and Pykarra, going down to the Wynaad."

"During the rains when it breeds, although many breed in the Deccan, as, for instance, about Sholapur, the majority, I think,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

move northwards and westwards, extending over the western parts of the Central Provinces, the Central India Agency, the southern and central portions of Rajputana, Khandesh, Guzerat, Cutch, Kathiawar and Southern Sind."

"The migration is, however, irregular, as in some years it extends much further than in others. The birds are plentiful in one year where in the next none or few are to be met with."

"In years when the rainfall is plentiful, they are pretty common during the monsoon a little south of Delhi, in Rohtak and Gurgaon. Generally, there are a good many about Jhansi and so on, but except as stragglers, they are not found in those parts of the country that I know further north than a line joining Sersa and Delhi, nor do they cross the Jumna in any numbers."

"Although I have known single specimens killed near Lucknow, Sultanpur, and other places in Oudh; though I have myself shot single birds occasionally in the Meerut and Etawah districts; though Ball got a specimen in Serguja, Hodgson others in the valley of Nepal; though Jerdon says he has known of their occurrence in Purneah, and Parker tells me they have occurred in Nuddea; though one specimen has been killed on the Mekran Coast near Gwader and another at Sandoway in Arakan, I do not, as at present informed, consider that either Beluchistan, the Punjab, the North-Western Provinces, north and east of the Jumna, Oudh, Chota Nagpore or any part of Bengal or the countries eastwards, can be properly included within its normal range. It occurs nowhere out of India."

It will be seen that Hume refers to a bird shot at Sandoway on the Arrakan Coast. This record is from the *Bengal Sporting Magazine* for 1835, where a writer, on page 151, records the shooting of a Lesser Florican, and this record is quoted by Blyth in his "Birds of Burmah," p. 152. It is, however, extremely doubtful if this record is a really correct one and *Sypheotis aurita* should not be accepted as a Burmese Bird on the strength of it. The next point furthest east from which it has been recorded is Dinajpore, from which place there is a specimen in the British Museum, and further south of this again from Purulia, Purnea and Nadia, from each of which district stragglers are occasionally

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

obtained, but it has never been obtained from any of the districts east of the Teesta or south of the Brahmapootra Rivers, leaving thus a very wide stretch of country or sea to be passed over before the Arrakan Coast is reached.

To Hume's districts of Purnea and Nadia in Bengal, from both of which districts I have also seen specimens, must be added Maldah where birds have been seen and shot by Mr. G. Hennessy.

As regards the Punjab and North-West Provinces, birds wander into these so regularly, year after year, though in but small numbers, that it is hardly possible to regard these Provinces as outside their normal habitat.

In the south, Major Ch. MacInroy says that "Florican are pretty numerous throughout East Mysore, but, for some reason which I cannot divine, are not nearly so much so in the western division of the Province." He further records a bag of 30 birds made some 25 miles from Bangalore and adds that 4 or 5 birds have been killed in a morning near Coconada.

In his list of the Birds of the South Konkan, Vidal remarks that the Lesser Florican "rarely pass the Ghat barrier which divides the Konkan from the Deccan. In seven seasons spent in the Ratnagiri District I have only seen two birds" . . . . "I have also heard of one having been obtained at Dapuli."

Mr. N. S. Symons reports two birds shot near Panwell in the S. Bombay Presidency; and Dewar, it should also be mentioned, notes that it is seen sometimes near and about Madras, but it occurs in that district regularly and is resident, and it extends north into Orissa, Blyth having shot it near Cuttack.

In a footnote, p. 24, of "Game Birds", Hume quotes Hodgson as saying: "Appears here (Valley of Nepal) about middle of May and disappears middle of June" and then he (Hume) goes on to say: "It may be that there is a permanent colony of this species, of which I know nothing as yet, in northern Behar, Gorakhpur, Busti, etc.

In partial confirmation of this surmise Mr. A. E. Osmaston sends me the skin of a young male from Gorakhpur and in the letter sent with it, writes: "I also saw them at the beginning of last rains (1909) but I have never seen them at any other time

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of the year here and I presume they only come here to breed and I think only a few come even then, as the grassy land they seem to like is very limited in extent."

This record, therefore, though confirming the presence of Likh in and about Gorakhpur during the breeding season does away with the theory of a "permanent colony" and infers that these birds, as well as those which reach Nepal migrate from a good deal further south than Hume imagined. From Bihar Mr. Inglis reports them as decidedly rare and has not seen many himself. He tells me that he has skins of birds shot in Bihar in April and May, in one case that of a male just assuming breeding plumage.

The Lesser Florican is undoubtedly locally migratory, but, as Hume remarks, its migrations are most uncertain and irregular and are probably governed by the state of the rains and food supply and possibly by other factors not yet known either to field naturalists or scientists. At present, all that can be said is that during the breeding season the birds seem to concentrate in suitable places in the centre of their habitat and after this season is over to disperse, more or less, in all four quarters, stragglers then appearing far from any of their favourite haunts. Hill ranges certainly divert and interrupt these local migrations to a great extent wherever met with, and it is more than possible that the bigger rivers, such as the Jumna, may have a similar effect. At the same time, the Lesser Florican does surmount some Hill ranges, for they migrate into the Valley of Nepal, as already recorded, and it has been shot on the Nilgherries as well.

The Likh, or Lesser Florican, is not gregarious like those Bustards with which we have already dealt. In suitable country, of course, many birds may be met with in the same extent of grass land, but they will be found at some distance apart, never in flocks, and though sometimes in pairs yet more often singly, except in the breeding season.

This little Bustard, according to Jerdon, "frequents long grass in preference to any other shelter. It is, however, often to be met with in green fields, in fields of Cotton and Dholl, and, in the Carnatic, so much in those of the grain called *Warragoo*, as to be called in Tamil, Warrago Koler, or Warragoo Fowl."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

All other writers agree with the above; Hodgson adds hill rice to the crops they frequent and Hume says that they are often found in millet fields, other sportsmen have written to inform me that they have shot them out of bajra, Indian corn, wheat and even young sugarcane. Inglis also informs me that in Behar they are sometimes put up in the indigo fields which affords them good cover.

In fact, the Likh may be found in any crop which is dry under foot, not too dense to make walking difficult and not too high, but preferably they keep to grass land or to grain fields into which they are tempted to feed.

Unfortunately the Likh has a habit during the breeding season of jumping into the air to attract the opposite sex and this has led to its undoing. All the writers quoted by Hume mention this habit and its disastrous effects and Hume himself says. "Owing to the unsportmanlike manner in which these beautiful birds are massacred during the breeding season, they are everywhere diminishing in numbers and will, in another half a century, be, I fear, almost extinct." Mr. J. Davidson also recorded that year by year he noticed a diminution in their numbers in the Deccan. They are not yet extinct, nor have their numbers decreased to the extent Hume feared, but there can be no doubt that everywhere the Lesser Florican is less common now-a-days than it was when Hume wrote in 1879, thirty-two years ago.

Davidson, describing the way they are killed, writes, "Florican are found sparingly in Mysore, but I only saw one on two occasions in the Tumkur District, during last year. It is a migrant during the rains to Western Guzerat where it is remorselessly shot down while breeding, but apparently avoids the Panch Mahals almost entirely; at least only one specimen has been secured there during the last few years.

"They are ordinarily shot in the Deccan in the long grass bhirs, being flushed by a line of beaters, the guns walking along with the beaters. In the breeding season the cocks are sometimes shot in the following way:—In the early morning the gunner, *for one can hardly call him a sportsman*, goes to a bhir, where he knows there are birds, and waits till he sees one jump up in the grass

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A. BEATER IN CUTCH WITH LESSER FLORICAN OR LIKH (*Sypheotis aurita*).

B. FEMALE LESSER FLORICAN ON NEST.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and cry. He then stalks within 50 or 60 yards, and again waits till the bird jumps and then runs as fast as he can towards the spot. The bird generally rises 30 or 40 yards off, and there is a fair amount of excitement if not of sport, in shooting them in this way."

Capt. Butler gives a similar description as follows:—"For my part, I have always protested against the wholesale destruction of these fine birds in the breeding season, and tried very hard when I was in Deesa, to persuade sportsmen (!) to spare the hens. But it was of no use; they argued that, 'if they didn't shoot them, some one else would,' and consequently the Florican were shown no mercy.

"The usual method of shooting them is to walk them up in line, when they rise usually within easy shot. They are easily killed, and I have seen longer shots made at Florican than any other bird I know. In fact they drop if you fire at them at almost any possible distance (provided, of course, you hold the gun straight). At times, however, after being marked down, they are very difficult to find, as they commence running the moment they alight, and often get 200 or 300 yards away before you reach the spot where you have marked them down. But for this, scarcely a bird would escape."

Again, Mr. James says:—"The ordinary way in which a single gun pursues Florican is to walk through the grass, with a few beaters, listening for the cry of the bird and following it; in this way the bird can be tracked for a considerable distance. Before very long the bird will be seen jumping up above the long grass, as some think to pick grass hoppers off the stems. The best way then is to run as hard as possible up to the place when the bird will rise. They drop very easily to shot, but when once flushed are difficult to flush again."

All writers and sportsmen seem to concur in considering the Lesser Florican to be much less wild in its nature than any other Bustard and when in fairly high grass or crops they often lie very close, not rising until the line of beaters approaches within a few yards of them and seldom rising more than 30 yards in front of the line. Jerdon says that "it feeds chiefly in the morning and is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

then easily raised but during the heat of the day it lies very close and is often flushed with difficulty. I have known one instance of one being killed by a horse stepping on it."

On some occasions, however, even this bird lives up to the general reputation of its family for wariness. Jerdon himself admits that such a bird is sometimes met with and Hume says that in the cold weather when in short grass or young crops they are about the most difficult bird he knows to get near.

As might be expected the Likh is rather a favourite bird with Falconers; its habitat, its powers of flight and the ease and frequency with which it is found all combining towards this. Jerdon writes: "Its pursuit is consequently a favourite sport, and from the open nature of the ground it frequents, it is well adapted for being hawked. I have killed it occasionally with the Lugger, but generally with the *Shaheen*, and have already given an account of the manner of hunting it. Should the *Shaheen* miss her first stoop, I have seen the *Florikin* accelerate its speed so greatly, that the falcon was unable to come up with it again under 600 yards or so. I have seen one struck dead by the *Wokhab*, *Aquila vindhiana*. I had slipped a *Luggur* at it, which was in hot pursuit, though at some little distance behind, when two of these Eagles came down from a vast height, and joined in the chase. One of them made a headlong swoop at it, which the *Florikin* most skilfully avoided, only, however, to fall a victim to the talons of the other, which stooped almost immediately after its confederate, and dashed the poor bird lifeless to the ground. It had not, however, time to pick it up, for I rode up, and the Eagles soared off most unwillingly, and circled in the air long above me. The *Florikin* had its back laid open the whole length." (Jerdon's Ill. Ind. Orn. lc.)

It would seem a favourite prey of wild as well as tame falcons and eagles, for Hume also says that one of the very few specimens he obtained in the Etawah District was killed by a Bonellis Eagle after he had flushed it.

The flight of the *Sypheotis aurita* is much like that of other Bustards, but the wing strokes are rather quicker. Blanford says: "It flies well, with a quicker flight than other Bustards, having, when flying, a slight but peculiar resemblance to a duck." By

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"quicker flight" Blanford probably refers to a quicker wing movement and not actually to a faster flight, for the flight of the Likh is certainly not as fast as that of the bigger birds of this family.

When flushed it often flies a considerable distance and is then very hard to put up again, as it either squats close, allowing a line of beaters to pass over it, or it runs to a great distance and eventually rises far from where it was seen to alight. It is very strong on the leg and makes its way through thin grass or scrub jungle at an almost incredible rate, far faster than a sportsman can walk. Jerdon notes that "when walking or running it raises its tail, as is represented on the drawing, the lateral feather diverging downwards, whilst those of the centre are most elevated, as is seen in domestic fowls, etc., forming what Swainson calls an erect or compressed tail."

The voice of the Lesser Florican during the breeding season is said to be a harsh croak, this being indulged in by the bird during its nuptial flights. The voice of the hen at this time is described by Wenden as "a low clucking cry" but whether this differs from that of the male or not he does not say. According to Jerdon "it is said to have a feeble plaintive chirp or piping note when running or feeding" and he also says that when flushed it utters a kind of sharp quirk or note of alarm." A personal friend of mine, who has spent much time watching these birds, gives them credit for a rather large vocabulary. He remarks *in epistola*: "These Floricans have many notes besides the drum or croak they give vent to in the breeding season. When moving about feeding they constantly utter a low chuckle and also the chirp or piping note referred to by Jerdon. Males and females also call to one another in a croak like that just mentioned, but softer and lower."

The Lesser Florican not only suffers from the so-called sportsman who persistently shoots it throughout the breeding season, but they are also much persecuted by native snarers and bird catchers wherever and whenever they appear. Col. Fenton writes to me that he never came across these bird-catchers in Kathiawar, but that in the Deccan "the *phansi padees* or professional snarers never gave the birds any rest, and it is not surprising if they have

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

diminished of late years." Mr. James records the same in Hume and Marshall in which work he is quoted as saying "*Pardis*, the professional poachers of the Deccan, snare them along with Partridges and Quail, simply by setting a rope of snares down the grassy bank of a dry nullah and then beating the bushes."

The principal food of the Likh consists of grasshoppers and in catching these, and other insects, it often hops into the air after them, catching them on the wing. No insect comes amiss to it and it will feed freely on Cantharides, beetles of all kinds, worms, centipedes and even, when hard pressed, small lizards, frogs, etc. It is also largely a vegetable feeder, eating both ripe grain and tender shoots of young crops and grasses as well as many kinds of berries and young herbs.

Its flesh is generally held to be excellent, though Hume says it is not as good as that of its larger first cousin, the Bengal Florican, and compares its flesh to that of the Blue Pigeon. The food it eats naturally affects its eating qualities and one sportsman may eat it at one season of the year and find it almost unpalatable, whilst another, a little later, may find it just the reverse. Jerdon thought that "its flesh is very delicate and of excellent flavour and it is the most esteemed of all the Game Birds." Mr. James writes, *vide* Hume, "It is perfectly true that sometimes the effects caused by eating Floricans' flesh after they have been feeding on blister-flies is most painful and disagreeable. I myself have suffered from this cause."

The breeding season of the Lesser Florican varies much in different localities. Jerdon says that some birds breed in Southern India from July to November and that he has put the hen bird off her nest in August in the Deccan and in October near Trichinopoly, and he also says that he has heard of hens being found sitting as late as January. Hume says that the majority breed in September and October and this agrees with the observations of most other observers in the more northern of their breeding haunts. As regards Kathiawar, however, it would seem that they commence rather earlier. Colonel L. L. Fenton writes me: "Only an occasional bird is to be seen at any other season of the year, but about the end of June they arrive in great numbers in the Kathiawar

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Vids for the purpose of breeding. The large *Vids* round Rajkot, such as Kalipat, Kotaria, Ghanteshwar, Damalpur, etc., are celebrated for them at this season of the year, and I have here seen over twenty birds in one morning."

"There seems always to be a preponderence of cock-birds, but perhaps they are more in evidence than the hens, owing to their habit of jumping, and hens are, I think, at all times more difficult to flush than are the cocks. I cannot say where the greater number betake themselves after the breeding season is past, but it is an undoubted fact that very few remain in the Province, as they are rarely met with in the cold weather."

Allusion has already been made to the curious habit displayed by this bird of jumping into the air, to some height above the surrounding vegetables, in order to attract the notice of the opposite sex. Generally it is the male alone which resorts to this trick, but sometimes, at all events, the female also does indulge in it. Hume himself says that he has seen the female jumping, though he adds that this is only for the purpose of catching flies, etc., as they are disturbed from the grass. Mr. Wenden, however, whom Hume quotes, distinctly saw the female bird as well as the male jumping, and thus describes his experience—"On the 16th I went out and watched this bird for more than an hour, just about the time at which she had been flushed on the morning before from the single egg. From the tree on which I sat, with my binoculars, I saw her running rapidly out of the dense preserve, across the open and into the scanty patch in which was her egg. Here she moved about for some minutes feeding, and every now and then sprang into the air with a low clucking cry, which was answered by the male bird from the preserve, though at first I could not see him. Then as though a sudden thought had struck her, she darted to the nest, and after one or two springs, and walking round and round the egg, she squatted and deposited another. While she sat, she was quite silent, but the male bird, who had now advanced closer to me, kept springing in the air and crying continually. The operation of laying the egg seemed to last about twenty minutes—*i.e.*, from the time she sat to the time she rose and having made another spring or two walked round the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

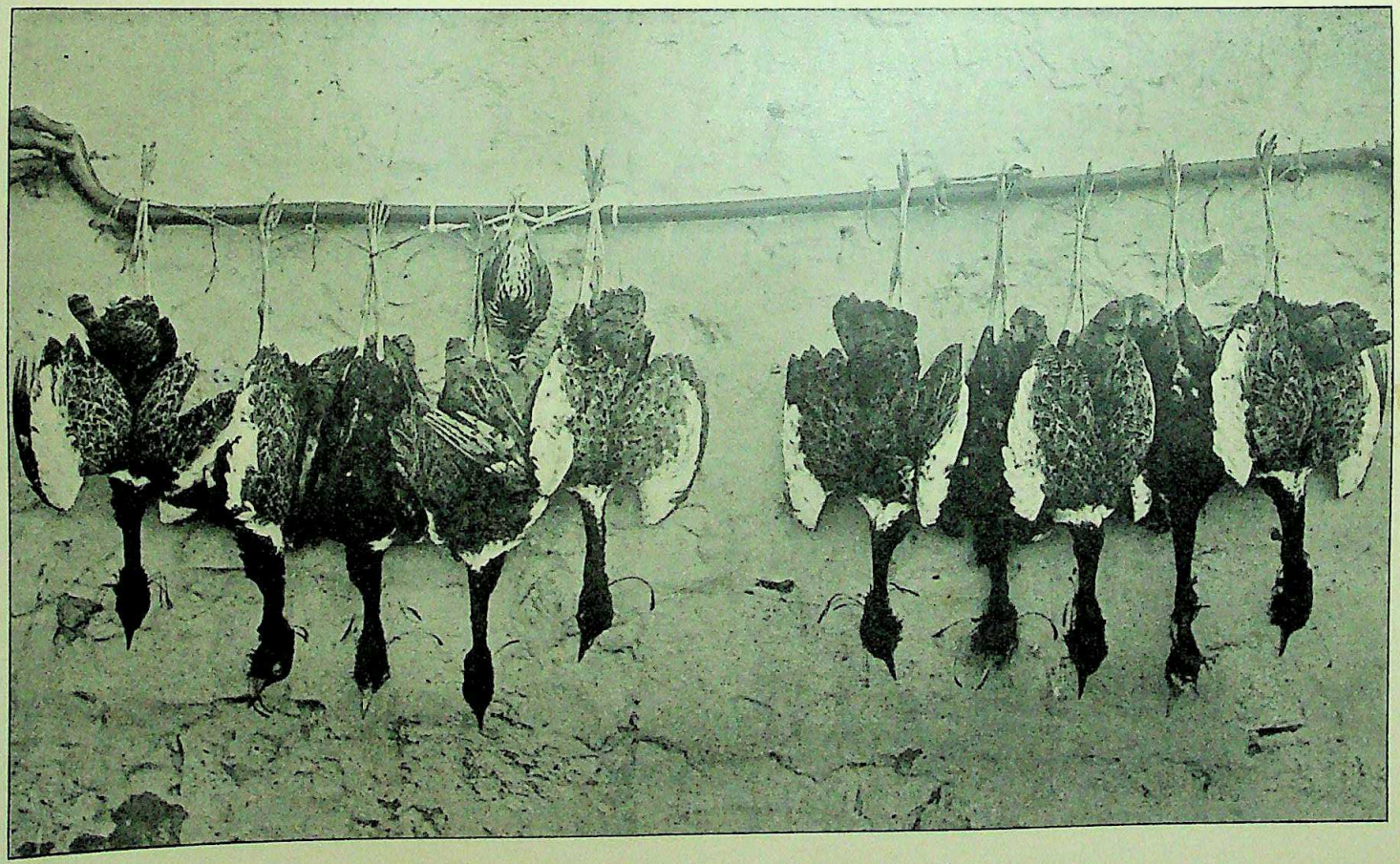
eggs; she then made straight tracks for the dense grass where the male bird was calling.

"I went out quite alone on this watching expedition, and all was quite quiet, and the birds were at their ease; but while I was still in the tree, a man came into the preserve with some cattle, and then I saw both birds spring several times *silently*, and after that I saw or heard nothing of them."

Mr. Davidson also describes this quaint habit at some length; he says:—"The Florican breeds all round Sholapur, in considerable numbers, wherever there are grass preserves with long grass. During the breeding season they seem chiefly to haunt the thinnest patches of long grass rather than those full of small bushes; they are at this period exceedingly difficult to flush, particularly the hens, which, even if you succeed in forcing them to rise, get up only at your feet and make but very short flights. The cocks are not quite so difficult to flush, but you are obliged to run towards them, to get even *them* up: if you simply walk after them they will rarely rise. Their whereabouts are, however, generally easily discovered by their frog-like call, and their occasional sudden jumps up into the air. They do not seem to call much when the sun is bright, but chiefly in the morning and during cloudy days. I have often watched them flying or jumping up, but I am still uncertain why they do it. My original impression was that they sprung up to seize insects from the grass stalks, but I have long abandoned this idea, as they rise much above the grass. Moreover, I have only seen one bird thus rise that could have been a female and this was dark-coloured, and probably a male that had not assumed breeding plumage, and I am inclined to consider these sudden flights as simply one of those bridal displays so common in the males, especially of gallinaceous birds, such as the flapping of the wings in Pheasants, the nautch of the Peacock, the lek of the Capercailzie, and the pouch-inflated strut of the big Bustard, and if it can be certainly established that this habit is confined to the males no alternative solution seems open to us."

The Lesser Florican is unlike most of its family "in India at all events" in that it is monogamous, whereas the others are either polygamous or "promiscuous" and the male is said to remain with,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



A BAG OF LESSER FLORICAN OR LIKH (*Sypheotis aurita*).

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

or near, the hen even after incubation has begun. Although this seems to be a generally accepted fact, there are a good many points which would seem to be against it. In the first place male birds which display *continually* throughout the breeding season seldom keep to one wife for the whole period, nor as a rule are monogamous males as pugnacious as are polygamous birds. Jerdon's description of the display and pugnacity of the Likh certainly look like attributes of a polygamous male. He writes: "The full and perfect breeding plumage is generally completed during July and August. At this season the male bird generally takes up a position on some rising ground, from which it wanders but little, for many days even; and during the mornings especially, but in cloudy weather at all times of the day every now and then rises a few feet perpendicularly into the air, uttering at the same time a peculiar low croaking call, more like that of a frog or cricket than that of a bird, and then drops down again. This is probably intended to attract the females, who before their eggs are laid, wander greatly; or perhaps to summon a rival cock, for I have seen two in such desperate fight as to allow me to approach within thirty yards before they ceased their battle."

The Bengal Floricans, males and females, undoubtedly do *not* pair at all, and the male is neither polygamous or monogamous, yet its courting displays are identical with those of the Lesser Florican as is the habit of the male of displaying in one particular spot whilst the females wander about the country. It is probable, therefore, that when we come to know the domestic habit of *Sypheotis aurita* more intimately they will prove to be similar to those of *Sypheotis bengalensis*.

The Lesser Florican makes no nest in which to deposit her eggs, nor does she, as a rule, even trouble to find or make a hollow for this purpose merely depositing them on the ground in some small bare patch in a field of grass. The grass field selected is seldom one of any very great size or having dense growth in it and the bird seems to prefer small pieces of grass of some two feet or so high and of scanty growth. The bird watched by Mr. Wenden deposited its eggs "on the bare ground, which was perfectly level (without the least signs of scratching) in some

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

thin scanty grass, about 2 feet high and about 2 yards in from the edge of the grass patch. Not a hundred yards from the plot of grass in which the eggs were deposited was a preserve, over a mile long by a quarter broad, of very high dense grass, a far more likely place, one would have thought, for so wary a bird to lay its eggs."

When the bird does lay its eggs in a vast stretch of grass, as is sometimes the case in Kathiawar, it is said almost invariably to choose some part where the grass is shorter and more scanty than elsewhere and also often to make use of some bare spot close to the outskirts of the field.

The nest, found by Mr. Wenden, contained three eggs, one found in it on the 15th, one laid on the 16th and the third on the 18th; this corresponds with what we should expect and with what I have heard from other observers and it seems, therefore, fairly certain that the species lays its eggs on alternate days.

As a rule the full clutch of eggs consists of four, but often only three are laid, sometimes but two and very rarely five. I have never seen a clutch with five eggs myself, but Lieut. F. Alexander recorded that this number was sometimes laid and Mr. James once found five chicks together.

In shape the eggs are typically very broad ovals, more spherical than those of any of the other Bustards; but for this they are hardly distinguishable from those of the Lesser Bustard, *Otis tetrax*, though on an average they seem considerably smaller. For instance the average size of the 26 eggs of the Likh in the British Museum collection is 1·82″ × 1·6″ (=about 46 × 40·6mm.) whereas the 23 eggs of *Otis tetrax* measure 2·07″ × 1·51″ (=about 52·6 × 38·2), these figures shewing well the difference in comparative shape and size in the eggs of the two species.

Hume gives the average of twenty-three eggs as 1·88″ nearly by rather more than 1·59″ (=48 × 40·5mm.) and the average of 18 eggs which have passed through my hands and are not included in any of the above is 1·84″ × 1·6″ (=46·8 × 40·3).

The surface of the shell is very smooth, though pitted with tiny pores, and there is always considerable gloss, very highly developed in many cases. The texture is fine and very close.

Hume thus describes his series of eggs now in the British

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Museum. "The eggs like those of the Great Bustard (which, though smaller, they greatly resemble), vary much in size, shape and colouration.

"Typically they are very broad ovals, with a feeble tendency to a point at one end; but some are nearly sypherical, some are purely oval, while one or two approach a Plover shape.

"The shell, everywhere closely pitted with miniature pores, is stout but smooth, and has always a slight, and at times a brilliant gloss.

"The ground colour varies from a clear, almost sap green, through various shades of olive green, drab and stone colours, to a darkish olive brown. I have seen no specimens exhibiting the blue and bluish grounds occasionally met with in the eggs of the Great Indian Bustard."

"The markings are brown, reddish or olive brown, occasionally with a purplish tinge, in some very faint and feeble, obsolete, or nearly so, a mere mottling, in others conspicuous and strongly marked; but in the majority neither very faint nor very conspicuous. In character they are generally cloudy streaks, more or less confluent at the broader end (from which they run down parallel to the major axis) and more or less obsolete towards the smaller end. Occasionally, however, they are pretty uniformly scattered over the whole surface of the egg."

"In size the eggs vary from 1·77 to 2·06 in length, and from 1·5 to 1·7 in breadth; but the average of twenty-three eggs is 1·88 nearly, by rather more than 1·59."

The eggs in my own collection agree well with the above but there is one pair which deserves separate description. These have the ground colour a most beautiful green grey, very pale and almost silver in tone. The markings are as described by Hume but are unusually bold and stand out conspicuously on the pale ground, making them both very handsome.

---

* The two photographic plates in this Number and the one of the Houbara at page 330 in the last Journal, are from photographs taken by H. H. the Rao of Cutch, a sportsman with an intimate acquaintance with these birds and their habits and one who has supplied me with many interesting details regarding them.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

(INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

PART XI.

(*Continued from page 544 of this Volume.*)

FAMILY—PAPILIONIDÆ—(*continued*).

89. Papilio crino, *Fabr.*—Like *P. buddha* but with the green discal band much narrower, especially on the forewing, the male has, generally, woolly scent-streaks on outer portions of veins 2 to 4 of forewing. Forewing in male and female with the transverse, discal band bluish-green, slightly sinuous, curved, narrow, increasing in width from costa to dorsal margin; more sinuous in the female. Hindwing with the band variable in width, but much broader than on forewing, continued above vein 7 to costa but much narrowed abruptly in that interspace; tornal ocellus claret-red with a large black centre inwardly edged with blue; a sub-apical whitish spot; subterminal diffuse, green lunules in interspaces 2, 3, 4; the spatular apex of tail with a patch of bluish-green scales. The whole upperside is irrorated on both wings with brilliant green scales but much less densely than on the basal area of the wings of *P. buddha*. *Underside* dull pale brown to blackish brown, irrorated with scattered, yellowish scales which, however, on the forewing are absent from a large, triangular, discal patch that lies between the dorsum, the median vein, vein 5 and a line of white lunules that crosses the wing in an outward curve from the upper third of the costa to just before the tornus; these white lunules are outwardly diffuse and merge gradually into the brown ground-colour. Hindwing: the tornal ocellus much as on the upperside; an obscure, ill-defined, highly arched, postdiscal, narrow, whitish band from above the tornal ocellus to the costa ending near apex of interspace 7 in a broad, white lunule; beyond this a double sub-terminal row of somewhat straight, ochreous-white lunules in the interspaces, each lunule of the inner row bordered outwardly with blue, this bordering very faint in some specimens. Cilia of both fore and hind wings brown alternated with white. Antennæ, head, thorax and abdomen dark brownish black; the head, thorax and abdomen above with a sprinkling of glittering green scales. Expanse 100-116 mm.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Larva.—"Somewhat limaciform; anterior segments convexly scutellated; furnished with a pair of short, fleshy tubercles on anterior and two on anal segments." (*Moore.*) "Colour bluish-green." (*Dr. K. Jordan.*)

Pupa.—"Curved backward anteriorly; head broad in front; green." (*Moore.*) From these descriptions of the larva and pupa may be gathered that they are very similar to those of *P. buddha.*

Habits.—There does not seem to be any record of the habits of the larva, but it is not probable that it differs as regards its ways from that of *P. buddha.* The imago is also not likely to differ from that species as to choice of the style of country it inhabits though it does not seem to be found below 2,000 feet above sea level. It has a peculiar distribution but it is difficult to say to what this may be due. It exists in Lower Bengal, in the Central Provinces, South India and Ceylon. It has not been found anywhere in the Bombay Presidency up to date but occurs in the Nilgiris. It is said to be "rather common in the Plains, especially in the Spring, in Ceylon, but also occurs in the mountains up to about 6,000'. The flight is very swift." (*Dr. K. Jordan.*) The foodplant is given as "Chloroxylon" by Dr. Jordan. It is fairly certain to be *Chloroxylon Swietenia*, DC., a member of the family of the *Meliaceæ* to which the Neem belongs; it is known as the Indian Satinwood tree and grows to a large size in Ceylon which is probably the place Dr. Jordan's information was obtained. This foodplant gives an indication of the sort of habitat the insect affects. The tree is found in dry, hot parts of the Bombay Presidency such as Bijapur, Dharwar and the east of Belgaum though the butterfly has never been, as stated above, yet noticed in any of these places. In Ceylon also it is limited to the dry regions. Its distribution is said to be the deciduous forests of the Western Peninsula as far as the northern edge of the Satpura mountains running between the Narbaddha and the Tapti rivers; but it is more than probable that it occurs further north-east, extending through Chutia Nagpur into the Behar Hills and, possibly, still further north up to the Ganges, on the Rajmehal Hills; and this simply because *Papilio crino* is found in Lower Bengal; that is the occurrence of the butterfly there is certain to indicate the existence of the foodplant of its larva. This is not the only interesting botanical inference which may be drawn from the entomological fact.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Besides the question of distribution there is also a question of the affinities of the foodplant, *Chloroxylon*. It has been stated that the larvæ of the genus *Papilio* in India or, to narrow the question down further, of the genus as composed of the groups of *Papilio* mentioned in these papers more particularly, feed upon plants belonging to certain well-defined botanical families, each group being absolutely limited to one family in particular. These families are *Anonaceæ*, *Rutaceæ*, *Aristolochiaceæ*, *Lauraceæ*, all with aromotic leaves which make it easy enough as a rule to place them where they botanically belong. The Satin-wood is generally placed by botanists in another family, the *Meliaceæ* where, evidently, the butterfly thinks it should not be. It has been mentioned before, also, that *Papilio demoleus* larva was once found on this plant in the Bijapur District of the Bombay Presidency; causing, at the time, considerable surprise as the foodplants of that larva were, as evinced by thousands bred in different localities at all times of the year, all rutaceous. This led later to enquiry into the affinities of the plant which, probably owing to ignorance, ended in no definite result until the following statement presented itself in Brandis' "*Indian Trees*", *viz.*: "Engler in Engler u. Prantl iii. 4, 171 places *Chloroxylon* under *Rutaceæ* chiefly on account of the translucent glands in the leaves, which form one of the distinguishing characters of that order." From which, backed up by a careful comparison of the descriptions of *Chloroxylon* with some of the genera of *Rutaceæ*, the probabilities are that *Papilio crino* knows more about real affinities in plants than botanists—except Engler.

There are butterflies of the same sort as *buddha* and *crino* in Burma and the Malayan Region. *P. palinurus*, F. from Burma, Malay Peninsula, Sumatra, Borneo and Banguey Island is like the former but has the band on the hind wing narrower and is generally smaller; it has subspecies in Palawan (*angustatus*, Staud.) and in the Phillipine Islands (*dædalus*, Feld.); *P. blumei*, Boisd. is a fine species inhabiting Celebes, with rather broad blue-green bands to both wings and blue-green tails. The green of our two species shows peacock-blue in certain lights, violet in others; when flying in the sun it appears always very brilliant metallic green.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

90. Papilio buddha, *Westwood.*—Male *upperside*: black, closely irrorated with brilliant green scales, the basal area up to the discal green band much more closely than elsewhere. Forewing with a very slightly excurved, oblique, bright green discal band that extends from the middle of the costa to the dorsum well before the tornal angle; measured on the dorsum the width of this band is more than one-third the length of the dorsal margin; anteriorly it passes through the apical third of the cell and is narrowed slightly at the costa; the irroration of green scales beyond this band is much thinner than at base of wing and is confined to a triangular patch from apex of wing downwards along terminal margin. Hindwing with the median third beyond the basal irroration occupied by an outwardly curved, brilliant green patch interrupted by vein 6, in continuation of the band of forewing, reaching the dorsal margin and slightly narrowed at both ends (sometimes it is slightly produced into interspace 7), its outer margin diffuse; this is followed by a subterminal series of ill-formed green lunules traversing the outer black area which is, including the tails, otherwise devoid of green scales. The costal area beyond vein 6 is dark brown with a subapical bright ochraceous lunule. Finally there is a tornal ochraceous ocellus centred largely with black. Cilia of hindwing brown, alternated with ochraceous. *Underside* softly brown-black,; bases of both fore and hind wings somewhat thickly, the outer portions more thinly, sprinkled with pale yellow scales. Forewing: apical half obliquely pale brownish white, darkening to dusky blackish at apex and narrowly along termen; the pale area narrow at termen, gradually broadened up to the costa, traversed by the black veins. Hindwing: uniform; an outer pale terminal band traversed by a subterminal series of ochraceous lunules bordered on both inner and outer sides by velvety black (hardly at all on the inner sides), the inner side further bordered conspicuously by silvery white; the lunule in interspace 7 much larger and bolder. Antennæ, head, thorax and abdomen velvety black, the head and thorax above irrorated with green scales. Female differs from the male in having the tails broader and, generally, in having the subapical ocellus of the hind wing larger. Expanse 92-102 mm; sometimes larger. The male about equal to the female.

Egg.—The egg, laid generally on the top of a leaf, is light lemon in colour at first, but soon gets a broad rusty band round the centre with a darker, irregular, rusty line in middle of band, the summit of egg with a rusty (colour of darker line) large patch. In shape it is spherical; the surface is slightly shiny and obscurely frosted-rough. Diameter 1. 3mm: very small for the butterfly.

Larva (1st stage).—The head is round covered with short, black hairs and is coloured translucent very light buff, slightly darker on each side near the apex of clypeus; eyes black: clypeus large. The shape of the larva

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

is the same as that of the larva of *Pap. polymnestor*, &c., at the same stage. Dorso-lateral tubercles of segments 2 and 13 are long, conical, fleshy; dorso-laterals of segments 3, 4, 5 and 12 are about half the size and exactly similar; those of segments 6 to 10 are half as small again as those last mentioned and rather cylindrical; there are no sub-dorsal tubercles except one at the base of the dorso-lateral of segment 2; supra-spiracular-tubercle of segments 3 and 4 as large as dorso-lateral of same segment and similar to it, those of segment 4 possibly the larger slightly; spiracular tubercles disposed as usual, very minute with 2 or 3 black spines. Surface dull. Colour a livid greenish-yellow with a very dark olive-green dorsal band from segment 3 to 11, covering the whole dorsum of segments 3, 4 and 5, becoming a mere line on the last segments; a broad lateral band of same colour from segment 5 to 12 with a thin line of the body colour running down the middle; belly and base of legs dirty greenish; segments 2 and 13 with the tubercles light greenish-ochreous; all the tubercles shiny translucent and all the spines on them (with the exception of the spiracular spines of which are black) are yellow. L: about 4·5 mm. with tubercles; B: 1. 25 mm. without tubercles and 2·25mm. with at broadest part which is segment 4.

2nd stage.—Is very similar to the same stage of *P. tamilana*; the sub-dorsal tubercular spots only exist near the front margin of segt. 5: on no other segment; the subdorsal, small, fleshy, spined tubercles at base of laterodorsal tubercles of segment 2 still exist; the laterodorsal fleshy, conical tubercles exist on front margin of segment 2, hind margin of segment 13, in centre of segments 3, 4, 5 and 12 though these central tubercles are much shorter than the marginal ones of segments 2 and 13; the dorsolateral tubercles of segments 6 to 11 are very small, central, spined like all the rest; the supraspiracular tubercle of segment 4 is little smaller than the dorsolateral tubercle of segment 2 and the supraspiracular tubercle of segment 3 is in size between these last two; the supraspiracular of segment 2 is nearly the same size as that of segment 3; the supraspiracular tubercles of segments 5 to 12 and the other spiracular tubercles of all segments are mere spots with one or two hairs on them. The head is yellowish and is covered with minute erect sharp hairs which are black but not densely; the head is suffused with brown on upper part of the clypeus; which is of ordinary size, triangular, and along the margins bounding the clypeus; is roundish, very slightly bilobed, shiny. The surface of larva is shiny and covered sparsely with minute black hairs on segments 2 to 5. Colour of larva is rather dull olive green, the spiracular region greyish, a lateral greyish line; a rather broad subdorsal whitish region on segments 6 to 11; segment 5 marked yellowish in its hinder half, this marking being continued along the lateral region of segments 4 to 2 as far as head; there is a dark spot or patch just below lateral greyish line on segments

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

6, 7 and 8; base of large tubercles of segment 13 strongly ochreous, the base of those of segment 2 less so, the rest transparent greenish; all the spines of tubercles whitish. L: 10mm; B: 3mm. at segment 4 without and 4mm. with tubercles.

3rd stage.—The larva has lost the dorsolateral tubercles of segments 6 to 11 completely, but has those of segments 2, 3, 4, 11, 12 still, those of segments 2, 11 and 12 as large as ever, those of segments 3, 4 mere knobs: the supraspiracular segments of segments 3 and 4 are still there, the former about half the size of the latter and the latter smaller than dorsolaterals of segment 2. All signs of supraspiracular and spiracular tubercles completely gone. Head is greenish and covered with extremely minute hairs. Surface of body is only slightly shiny. Colour is dark green with an irregular spiracular white line, a white band along base of legs, the space between marked whitish, the tubercles ochreous, a yellow line joining bases of supraspiracular tubercles of segments 4, 3 to base of dorsolateral tubercle of segment 2, and a maculate light yellow broad band from base of supraspiracular tubercle of segment 4 on one side runs back and along hinder margin of segment 5 over dorsum to supraspiracular tubercle of segment 4 on the other side; a yellowish small patch on the common margins of segments 6/7, 7/8, 10/11 dorsolaterally with the margin thinly yellow between over dorsum; some indistinct yellowish spots all over. L: 15mm. at rest by B: 5mm. at segment 4 and 5mm. with tubercles.

5th or last stage. (Pl. 1, Fig. 15).—The larva in shape and general appearance is very like that of *P. tamilana*. The head is light green, the eyes black; and is of the usual shape. Segments 2 has the front margin straight with a small tubercle at each end of it; the dorsolateral tubercle of segments 12 and 13 also remain, those on the former minute, on the latter as large as those of segment 2. Spiracles rather small, coloured like the body with linear whitish centres. Surface smooth and dull. The colour of the larva is dark green, spotted finely with light yellow; a subspiracular yellow band from segment 6 to segment 12; a distinct subdorsal row of tubercle-like yellow spots on segments 7-12; a transverse row of yellow spots near front margin of segment 4 ending on each side in an indistinct ocellus or eye which, however, may occasionally be distinct and black—this row of spots representing the front crest of the *P. tamilana* caterpillar; on segment 5 is another transverse crest near hinder margin with a thick spotting of light yellow continued under the ocellus forwards by a narrow yellow band or line up to the base of the tubercle on front margin of segment 2. The space enclosed between the two crests and this band or line is oval in shape, longer than broad and is often called the "shield"; it is somewhat flattened and often greyish looking ventrum, anal flap and legs watery greenish white. L: 46mm; B: 10mm. at the broadest part which is segment 5.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Pupa (Pl. 1, Fig. 15 a.)—Is very like that of *P. tamilana* in shape and colour; except that, as regards the shape, the dorsal line is much straighter, the front part formed by segments 1-5 not being thrown back at such an angle as in that species : the thorax is slightly less humped, the headpoints are longer: nearly as long as they are in the pupa of *Papilio pamon*. There is a very slight carination in the dorsal line from segment 2 to cremaster. Spiracles small, oval-linear, the same colour as the body of pupa. Surface dull and more or less smooth. Cremaster strong and square at end. Colour dark green ventrally much lighter dorsally to approximate to the upper and underside of the leaf of the plant it feeds on; dorsal line, dorsoventral line from cremaster to shoulders and ventral suture-line of wings, all yellow; there is a subdorsal jet-black spot on segments 6. L: 32 mm ; L: 10 mm. at middle.

Habits.—The egg is laid on young shoots, or on the top of an old leaf in the monsoon months. The larvæ prefer leaves that are not too young as food ; they lie in the centre of the upperside of leaves on a bed of silk, separately of course: that is, never more than one on any one leaf ; and the yellow speckling of their skins makes it difficult to see them as the leaves of the foodplant are very similarly marked with spots produced by the agency of some insect. The pupa is almost invariably formed on the foodplant, hanging from, and attached to, a twig or twig and leaf—midrib with a moderately long body-band and strong tail fixing ; thus hanging with the light coloured back showing to an observer on the ground among the light green leaf-undersides while the dark ventral green, directed upwards, harmonises with the dark green of the uppersides of the leaves to aid in protecting it against detection from above. The osmeteria are reddish in colour but the larva does not often make use of them, that is, it rarely protrudes these scent-organs. The imago is not really a butterfly of the Plains as distinguished from the Hills, though it is perhaps fonder of open scrubby jungle and continuous sun-shine than most other swallowtails. Its habitat is given as Southern India and it seems to be confined to the western coast where it is perhaps commonest in the low hills along the sea, board wherever its foodplant is found ; it certainly ranges from sea level up to 2,000 feet. Its range is most probably determined by heavy rainfall. As indicated above, this beautiful butterfly rejoices in the hottest sunshine and in the Kanara District, where it is very fairly plentiful, it offers one of the most

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

inspiring sights to the active lepidopterist. It is a fast flier and nearly always keeps to the tops of the trees round which it circles in rapid activity. It is consequently difficult to catch; a long net and a quick eye are absolutely necessary to effect a capture. Even then it is nearly impossible without a careful choice of a place of vantage. The best way is to choose a Tirphal tree (the vernacular name of the foodplant in Mahratti) round which the butterflies circulate, with a rock or high place near it and wait until an insect flies within reach; or, better still, choose two trees on a hill side or on uneven ground, one of which is higher than the other and stand between them. The glint of the blazing green of the wings as the insects pass below the level of the eye will generally ensure an amount of perseverance in the chase that should result in ultimate success. Captures are always found to be males, and the reason is difficult to guess, except it were a fact that more of that sex were born than females. This, however, is not the case as has been proved by breeding from the egg and caterpillar. Indeed breeding results in more females than males. Females lay but one egg at a time, and do not take long about it; they fly as fast and as swiftly as males; but no one can say whether they keep it up as long: perhaps they do not, and rest for long periods at a time, but even this would not explain why so few are caught in the net, for there must be thousands and thousands of individuals in any one locality. Female *buddha*, unlike the females of other insects which are also rarely met with and which keep so it is said to the underwood and tree tops in dense jungle, frequents open ground as often as the males and so ought to be visible as often as these. She must fly at a different time to the male; it is the only explanation; and that time cannot be the hottest hours of the day. So little is known about such matters! The larva feeds upon *Zanthoxylum Rhetsa*, DC., mentioned before as one of the foodplants of *Papilio helenus* and has not been found upon anything else. *Zanthoxylum* is a genus of the *Rutaceæ*.

The caterpillar of this most taking insect was first discovered by the late E. H. Aitken, that most genial of men and pleasantest of companions, in the year 1894 in the vicinity of Karwar

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on the sea-coast of North Kanara District. He formed one of a combination of three naturalists, who found themselves thrown together in the early '90s in that beautiful spot, and forthwith proceeded to work out the life histories of all the butterflies of the surrounding country. Nearly all the observations upon which these papers are based were carried out there; a large number in those early days of the brotherhood of three, later by two and then, finally, when inexorable circumstances led to mutually regretted separation, by the remaining one. But the early days were the best days for everything was new, and there was unlimited material to work at. Every day brought forth something of interest; every expedition was crowned with abundant success. The larva of *buddha* was much sought after at that time, but had eluded discovery for many months of patient search. The food-plant was known; or, at least, it was taken for granted that it must be Tirphal, for the butterfly was noticed constantly flying round such trees. At last E.H.A. (for those who may not remember him by the initials, it will only be necessary to mention that he was the author of "Behind the Bungalow", "Tribes on my Frontier" and other good books), found a little caterpillar upon a Tirphal leaf and took it home without saying anything about it. He was very excited and hugged the secret from midday until dark that day; but then he could bear the strain no longer and gave it away. There was great rejoicing among the three and every morning, for several weeks after, very tender inquiries were made about its health and progress in growth, or it was inspected with expectant interest. Then one morning it was reported ailing and anxiety was great. Next morning it was dead. That was a day of gloom; but the depression resulted in a firm resolve to seek for more caterpillars and the consequence was that in less than a week, there were half a dozen of all sizes in the breeding cages. The rest was easy.

91. Papilio antiphates, *Cram.*—Male and female *upperside*: white. Fore-wing: cell crossed by five short bands of which the basal extends to the dorsum, the subbasal into intersapce 1, the medial and pre-apical up to the median vein and the apical or fifth along the discocellulars; this last extends broadly on both sides of the veinlets and terminates at the lower apex of the cell; beyond these are broad, postdiscal and terminal, black,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

transverse bands from costa to tornal angle; the two bands coalesce below vein 4 and terminate in a point at the tornus; the white portions of the cell anteriorly overlaid with pale green; short, macular, hyaline green bands between the black, cellular, apical band and the discal band and anteriorly between the latter and the terminal band. Hindwing: basal three-fourths uniform white with black markings on the underside that show through by transparency; terminal fourth dark grey traversed by a curved, irregular, subterminal series of black lunules that ends in a black tornal spot and a terminal, black band that follows the indentations of the wing; the emarginations below the black, terminal spot edged with ochraceous; the tail blackish grey, edged and tipped with white. *Underside*: forewing similar with similar markings, but the green shading over the white portions in the base of the cell more decided; the discal and terminal, black bands separate, not joined posteriorly, the former edged posteriorly on both sides with dark grey, due to the black on the upperside that shows through by transparency. Hindwing: basal half green, the outer half white; a large black, tornal spot; a black line along the dorsum that curves above the tornal spot outwards to vein 2; a straight, subbasal black band from costa across cell that terminates at vein 2, joining the dorsal black band; a broader, black band from costa across apex of cell extended into base of interspace 3; an irregular, discal series of black markings curved inwards posteriorly towards the tornal spot; a subterminal series of very small, slender, black lunules in pairs (variable in size and distinctness), the ground-colour on the inner side of these darkened to rich ochreous yellow; lastly, a series of short, terminal, black bars in the interspaces so arranged as to follow the indentations of the termen; tail dusky black, edged with white. Antennæ black; head and thorax anteriorly with broad, black, median band, rest of thorax bluish; abdomen white marked beneath on each side by a black stripe.—Expanse 90-104mm.

Larva.—The caterpillar of this species is very like that of *P. nomius* in general facies, especially when young. The head is rather round in shape, drawn under segment 2 in repose; it is green in colour. Segment 2 is little broader than the head and is slightly convex, trapezoidal in contour, with a thin ledge along the front margin. Segments 2, 3 and 4 taken together are truncated—triangular in shape, very slightly convex transversely, the base of the triangle being the hinder margin of segment 4, the truncated apex being the front margin of segment 2; the lateral sides of these segments are nearly perpendicular to the ventral surface, even slightly sloping in towards the legs. The hinder margin of segment 4 is the broadest and highest part of the larva, whence the body gradually decreases in diameter to the cremaster which is somewhat long and narrow, running out at each corner of the truncated end into parallel, rather long, sharp points, one to each corner, separated by a straight line between their bases. The dorsal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

half of segments 5-14 is very convex transversely, the sides nearly perpendicular to the ventral surface. Segment 13 is short though quite apparent. Segments 3 and 4 have each a short, sharp, conical, lateromarginal tubercle situated in the centre; segment 2 has a small one at each end of the front margin. Spiracles are oval, black, with a white central slit to each. The surface of the body is covered with hardly perceptible semi-appressed, white hairs; the legs and two end-points are set with somewhat longer erect ones which are brown on the latter and white on the legs; the surface is otherwise smooth and is dull; the segment slightly constricted at margins. The colour of the larva is a darkish transparent looking olive-green speckled thinly with white on the dorsa of segments 5-14, the specklings being arranged so as to form a white dorsal line and a dorsolateral darkish line, a dark diagonal stripe on segments 5-11 running across from one segment to the next succeeding from the centre of the dorsoventral margin of one to the darkish dorsolateral line of the succeeding one; there is a broad, spiracular, white-yellow band, below which there is a deep green subspiracular one followed by a whitish band bordered below by a green one; the legs are watery green; the dorsum of segment 2 is yellowish white with a dorsal green line; the flattened deep green dorsa of segments 3 and 4 are surrounded completely anteriorly, laterally and posteriorly by a yellow-white band and the lateral parts of these segments are suffused with reddish black; tubercles on segments 2, 3, 4 are black. L: 40mm.; B: 9mm. at the broadest part at segment 4.

Pupa.—The pupa on the whole is of the type of that of *P. nomius* though of course there are considerable differences in colour, shape and method of suspension. The head is quadrate seen from above, triangular from the side; eyes only slightly prominent; frons at an angle of 60° to longitudinal axis of pupa; from head the lateral outlines diverge to shoulders, are then parallel as far as segment 4, after which the wings are expanded in a considerable curve rather suddenly, merging gradually further on into the surface of the abdomen about front margin of segment 8; ventrally the wings are only slightly convex along the ventral line: it is very nearly parallel to the dorsal line; the ventral line of abdomen beyond is slightly convex also converging gradually towards the dorsal line towards cremaster; this dorsal line straight from cremaster to the apex of thorax, sloping gradually away from the longitudinal axis of pupa at an angle of about 25° to run out at thorax-apex into a short, blunt point directed forwards at an angle of 45° with that axis; the cremaster is strong, parallel-sided, rather long, lying more or less along the surface of attachment. The surface of pupa is dull and has the following low ridges on it: one circumscribing the frons of head, one along dorsal line of frons and segment 2, produced on to segment 3 as far as the thoracic blunt point, a slight ridge from head to shoulder-point laterally, another, in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

continuation, thence to where wings commence to expand and along the expansion-edge, continued along sides of abdomen as far as cremaster; the head-front is flat, segment 2 slightly convex, the abdomen dorsally above the carinæ also flattened on segments 4-8. The spiracles are longly oval in shape and light in colour and are of ordinary size. The colour of the pupa is bright green, with a dorsolateral line on segments 4 to 8 where it merges into the lateral ledge-line of abdomen, yellow; the base of thoracic process or point and this point, the head-ridge and those from it to shoulders with those thence to wing-expansion edges, brown; carinæ of segments 1, 2, 3 broadly flanked with brown, narrowing on front margin of segment 2; segment 2 with a brown linear mark laterally; ventral central line yellow. L : 30mm.; B : at broadest part 10mm.; thoracic point 1mm. long.

Habits.—The egg is laid single on the upperside of a fresh leaf or shoot and is of the ordinary spherical shape, greenish white in colour when first deposited, hardly shiny. The little larva takes to the midrib at once, but nearly always wanders to feed on the edges of other leaves than that upon which it has chosen to make its bed of silk and take up its abode. As it grows it occasionally changes its seat, making a new one, and, finally, when full grown, like most other *Papilio* larvæ, it will occasionally quit the leaf and take to stems and twigs. In the last stage it keeps to shady, well hiden leaves and never lies out in the sun. The larva is sluggish and walks with a halting motion. It pupates against a twig or stem of a plant, under a leaf also, as occasion serves and the body string of the chrysalis is very long. The caterpillar is like that of *P. nomius*, the pupa is of the same type also but differs from that of that insect in some essential points, and is never formed anywhere but in positions above specified; it is always green in colour. The butterfly is a quick flier, not powerful but very graceful, stronger than *P. nomius*, and rises much higher towards the tops of the trees round which it may be seen circling on sunshiny days in the evergreen jungles of Kanara on the Western Ghats. It is most plentiful there in the monsoon months and immediately before and after, while the young shoots of the foodplant are still being put forth. It is a local species, keeping to the moister evergreen forests from sea level upwards and is nowhere excessively common. It comes to flowers like *P. nomius* and, in company with that species, members of the genera *Appias*,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Prioneris, *Catopsilia*, and *P. sarpedon*, *P. eyrypylus jason* and, occasionally, *P. dravidarum*, may be seen drinking on patches of damp sand in the beds of nallas and rivers or, after a shower of rain, on the wet mud of roads in the hot, close days that immediately precede the south-west monsoon. It then rests with the wings closed over the back though it exposes them, horizontally outstretched, in the ordinary *Papilio* style, when resting from flight on a leaf. The foodplant of the caterpillar is *Unona Lawii*, Hooker, and it has never been found upon anything else, although there are other *Unonæ* where it has been collected. *Unona* is belonging to the *Anonaceæ* and *Lawii* is an extensive climbing shrub common in the evergreen forests of Kanara. There are sub-species of this butterfly existing throughout Ceylon, India, Burma and the Malayan Region of which *P. antiphates alcibiades* is the commonest. Typical *P. antiphates* is said by Rothschild to come from Western China and Hainan but Bingham gives it as recorded also from Travancore. It is the butterfly of North Kanara also, where *alcibiades* does not occur. This insect will not be found in the Plains. *P. epaminondas*, Oberthür, with discal black markings on the upperside of the hindwing, comes from the Andamans. *P. androcles*, Boisd., and *P. dorcus*, De Haan, are two very fine species from Celebes.

92. Papilio nomius, *Esper*.—Male and female *upperside*: bluish-white. Forewing: the cell with five broad, transverse, black bands, the basal and subbasal bands produced to the dorsum, the medial band generally extended into interspace, the pre-apical ended on the median vein and the fifth or apical from costa along discocellulars extends on both sides of these and ends at lower apex of cell; beyond the fifth band is a short, transverse, macular band of the ground-colour that terminates on vein 5, followed by a very broad, black, terminal band that occupies about one-third of the width of the wing and is traversed by a transverse, subterminal series of rounded white spots. Hindwing: ground-colour along dorsum and above vein 7 whitish; a streak along the dorsum, a subbasal and an inner, discal, transverse band from costa across cell (sometimes interrupted in the middle), and a very broad, terminal band, black; the former two joined near the tornus by cross, lunular, black marks, the terminal band traversed by a series of slender white lunules; a black spot in interspace 1 above the tornus and another small one at base of interspace 4; the black at the apices of interspaces 2-4 and the lunules of the ground-colour thereon

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

suffused with grey; tail black, edged and tipped with white. *Underside*: white, the black markings very similar but of a bronze-brown with the following exceptions:—Forewing: extensions below the median vein of the basal, subbasal and median transverse bands crossing the cell, and the inner portion below the vein 4 of the terminal, broad band, black. Hind wing: the inner discal band is broken, irregular and black and is bordered by a series of red spots outwardly edged with black; and, sometimes, faintly on the inside as well, the subterminal series of white lunules are broadly edged on the outside with black; the grey patch on the caudal region is replaced by ochreous grey. Antennæ black; head, thorax and abdomen creamy white with a medial, broad, longitudinal band; the abdomen with lateral, black stripe; the thorax suffused with grey.—Expanse 68-95mm., the males being the same size as females.

Larva.—The caterpillar is greatest in diameter about segments 4, 5 and the dorsum is somewhat flattened, the sides being in a plane at right angles to it: the transverse section being a trapeze though, of course, with the corners rounded, the ventrum-base being the shortest side; it decreases in diameter rather rapidly to anal segment which is narrow, smooth, rather long, ending in two straight, diverging, squarely separated, triangularly conical points; segments 2 to 4 are conspicuously flat on the dorsal portion. The head is greenish yellow in colour, round, more or less hidden under segment 2 in repose; the front margin of segment 2 straight. Segment 2 is about twice as broad at the front margin as the larva is at anal extremity. The ventrum is flattened. Segments 2-4 have each a short, lateral, conical, sharp, black spine, centrally situated and all of equal length. Spiracles are small, oval, finely bordered with black. Surface is dull, smooth. Colour of larva is grass-green with a subspiracular, yellowish line; top of segments down to the lateral region is greeny-whitish with a broad, dorsal, olive-green band, generally indistinct on segments 2-4; every segment except the last has two depressed brown lines across the greenish-white part parellel to the front and hinder margins, giving the appearance to each segment of having three folds; segment 4 has four such folds, the three anterior of which are black; there is a brown, interrupted, lateral line bordering the dorsal greenish-white area of all segments; ventrum light green. The osmeteria are shiny, glossy green in colour. Some larvæ have black instead of brown in the above description and in this case the dorsum instead of being greenish-white is black with or without two or three short, transverse lines laterally to each segment 6-11 forming a dorso lateral interrupted band on each side. Sometimes the colour may be dark, rusty brown instead of black and then the lateral band of short white marks is wanting. L: 32mm.; B: at segment 4-5, 9 mm.; H: at same place, 7 mm.

Pupa.—The pupa is square-fronted pointed behind, with two well separated

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

head processes and a short one on thorax, base of this latter process nearly perpendicularly over anterior end of pupa, ventrum flattened, dorsum transversely convex. Head with two short, thick, diverging, square-topped processes, slightly compressed dorsally and ventrally, ventral side being in the plane of the pupal ventrum. Segment 2 nearly perpendicular to longitudinal axis of pupa as to its dorsal line; the dorsal line of thorax parallel to that axis, the apex produced out over slope of segment 2 into a 1·5 mm. long, 1 mm. thick, flat-topped point at an angle of 105° with front slope of segment 2, the dorsal side of it in continuation with dorsal line of pupa to which it is inclined at 135°; the inner margin of wing (lateral line of pupa) is raised on ridges, the ridge running up to and on to the thoracic process; there is no constriction about segment 5; the wings are expanded slightly in a rounded curve laterally at segments 5 and 6 where the pupa is consequently broader than anywhere else; the dorsal line from cremaster farward to apex of thorax is slightly convex, the ventral line is quite straight; cremaster is 4-sided, hollowed out ventrally in the middle somewhat, narrower at end than at base; the abdomen is somewhat 4-sided in transverse section, the ventrum and dorsum being flattened. Surface is rugose with exception of wings, dull. Spiracle of segment 2 indicated by circular depression or pit divided by the segment margin 2/3 which crosses it as a ledge, the spiracle being situated at the bottom of the front half; other spiracles are oval with central, narrow, raised yellowish ovals, and are the colour of the pupa. Colour of the pupa is a very dark rosy brown with the ridges lighter. L: 26mm.; B: 9mm.; H: 8mm.

Habits.—The egg, of the usual shape and colour, slightly shiny, is laid singly on the upperside of a tender leaf where the young larva, emerging, lives in the usual way: lying along the midrib near the point on a bed of silk. It is dark in colour when it first emerges, has the usual forked spines and is distinguished by having a dorsal white region on abdomen. It is sluggish, walks with a halting gait and wanders very little except at the end when about to pupate. At that time it turns pinkish all over under the former colour and, descending to the ground, gets under a stone, a clod of earth, or under a dead leaf where it strings itself up by the tail and a short, tight body-band in a horizontal position more or less, its back downwards, and there undergoes the change into the pupa in semi-darkness. The butterfly has only one brood as a very general rule; the early caterpillars of April-June, of which there are always few, form pupæ some of which emerge in a fortnight or so; but the great majority of the chrysalides lie over for

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ten months or more until the following year produces another crop of tender leaves. The foodplant is *Saccopetalum tomentosum*, Hooker, which loses most of its leaves during the hot weather and shoots profusely with the first rains when the butterfly is always most numerous. Dr. K. Jordan says that *Polyalthia longifolia*, Benth and Hooker, is eaten by the larva also. These two plants belong to the family *Anonaceæ* and the former is spread throughout India in the Plains and in the Hills. The insect is found in Sikhim; Central and Southern India; Ceylon. In Bombay the butterfly is found throughout Kanara, Belgaum, in parts of Dharwar, Bijapur and, doubtless, in many other localities in the plains, hills, forests and cultivated lands, and is very plentiful in certain places in the early monsoon months; it occurs from sea level upwards but nowhere, seemingly, at any great elevation; 2,000 feet to 3,000 feet seems to be about the limit. It flies fast but somewhat weakly, much closer to the ground than *P. antiphates* as a general rule, probably owing to the habit of the pupa. It is moderately fond of flowers, comes readily to damp patches of sand in the river and nalla-beds and to moist mud on roads in the hot pre-monsoon days in company with other butterflies and has the same ways of resting as *P. antiphates*.

P. aristeus, Cram., a very closely allied species nearly exactly similar, inhabits, with its subspecies, Sikkim, Assam, Burma, Tenasserim, Sumatra, the Malay Peninsula, Borneo, the Philippine Islands, many of the smaller islands of the Malay Archipelago, Aru, New Guinea and Queensland in Australia. *P. rhesus*, Boisd., is a very black species that inhabits Celebes.

93. Papilio doson, *Lin.*—This species was formerly known as *telephus*, Felder, also *doson* of the same author. It is now treated mostly as a subspecies of *P. eurypylus*, L., by lepidopterists.

Male and female *upperside*: black. Forewing: three slender, oblique, short, pale green streaks in basal half of cell and two irregular, small similarly coloured spots near its apex; a discal band composed of pale green spots that gradually diminish in size anteriorly, the spot in interspace 5 the smallest, the two in the interspaces above it slightly larger; a spot at base of interspace 7 and a sinuous, complete, subterminal series of similarly coloured ones. Hindwing: a transverse band that extends as far as interspace 2 posteriorly and is a continuation of discal band on forewing; the upper portion of this band white, the lower pale-green: this is followed

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

by a sinuous, subterminal series of small, pale-green spots as on the fore-wing. *Underside:* brownish-fulvous black; markings similar, larger, their edges slightly diffuse and all of a silvery white, slightly tinted with pale green. Hind wing, in addition, has a white, basal streak that extends halfway down the dorsal margin: another shorter, white subbasal streak from costa to the subcostal vein coalescent with the white of the discal band in the cell, the streak of ground-colour that lies between this subbasal band and the discal band jet-black, interrupted, where it crosses vein 8, by a crimson bar; finally, quadrate black spots near the apex of the cell and at bases of interspaces 1, 2, 3, all outwardly margined crimson. Antennæ, head, thorax and abdomen black; beneath the palpi, thorax and abdomen touched with white; the abdomen with dingy white, lateral line. The abdominal fold of the hind wing of the male is grey within with a fringe of white hairs.—Expanse 76-90 mm.

Larva.—The shape is similar to that of *P. nomius* though not so angular looking. The head is round, green, generally retracted under segment 2. Segment 2 is convex with a straight front margin with a small, black-tipped conical, horny spine or tubercle dorsolaterally on the margin; segment 3 increasing in width backwards, rather long, convex, ascending in dorsal line to segment 4 which forms the highest part of the body. Segment 5 is equally high and the region about the common margin of segment 4 and 5 is the broadest part of the body; the larva decreases in diameter thence backwards gradually, the transverse section always circular flattened ventrally; anal segment narrow, oblong, flattened dorsally, produced beyond claspers and ending narrowly in two diverging, not very long, more or less rigid points. Surface smooth, velvety, dull, head and ventrum downy, with a short, sharp, conical, shiny black conical spine laterally on segment 4. Spiracles oval, white, with a thin, black border. Colour bright grass-green, the lateral spine on segment 4 surrounded by a yellow 'eye,' with a subspiracular white band from segment 5 to anal end, the tail-points also white. The osmeteria are lemon-yellow in colour. The larva is sometimes black or very deep brown instead of green; always black in its early stages with the tail-points pure white; the egg-larva spined as usual; the segmental skin is always very dark green in colour. L: 38mm.; B: 10mm.; H.: 10mm.

Pupa.—Of the same type as that of *P. nomius*. Head prominently convex between the pear-shaped, bulging eyes; each eye with a short, conical anterior point, the front margin of pupa convex between them; segment 2 inclined to longitudinal axis of pupa at an angle of 45°, pentagonal more or less in shape, the longest side being the hinder margin, somewhat convex; thorax in the same plane of ascent as segment 2, perhaps slightly steeper, to the base of the long, thick, apical process which runs out from apex at right angles to front slope at an angle of 30° to longitudinal axis

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of pupa, and having its dorsal edge in continuation with dorsal line of pupa; this process is straight, rounded at extremity, keeled on four sides dorsally, ventrally and laterally; these keels continued down dorsum of pupa as far as hinder margin of thorax, to meet the lines of wings continuing the tornal half of the terminal wing-margin on segment 5; and, anteriorly, on to the vertex of head; the broadest part of pupa is at segment 8; thence it decreases to anal end gradually, the cremaster being strong, continuous with body, 4-sided, with ventral, beaded extensor-ridges; wings slightly expanded at segment 7. Surface minutely indented; on thorax above wing margin, is a small tubercle or rising. Spiracle of segment 2 indicated by a narrow, oval, yellowish slit bordered in front by a coarse ledge; other spiracles are narrowly oval, yellowish, not large. Colour olive-green, margins of segments and keels whitish yellow as well as the two lateral lines on abdomen, one to each side. L: 30mm. along dorsal line to end of process; 29mm. along ventral line to front of head; B: 10mm. at segment 7; H: 10mm. at the same point; L of thoracic process: 4·5mm. by 1·5mm.

A diagrammatic representation of the spines of the egg-caterpillar is given below.

Habits.—The egg is laid in the same manner as that of *P. nomius* which it resembles in every way. The little larva has exactly the same habits and the grown caterpillar behaves in the same way exactly except when it comes to pupation. *P. doson* larva strings itself up to a twig, branch, underside of a leaf on its foodplant or some adjacent tree or shrub by the tail and a short body-string. The pupa does not as a rule lie dormant like that of *P. nomius* for any time but, when kept in captivity towards the cold weather, without a chance of dew or moisture of any sort, it will lie over for months like many others. The colour of the pupa varies of course with the colour of the surroundings it is formed in, also like most others. The butterfly is one of the most powerful fliers of the whole genus and is fond of sunshine and flowers though it merely sips at these in a perfunctory way, wasting no time at any one blossom; it always seems to be in a great hurry and can only be seen at rest when sipping the moisture on roads and in the beds of nallas in company with others of the genus and the stronger winged *Pieridæ*; even then it is easily disturbed and flies straight away as a very general rule. It is extremely plentiful in Kanara in the hot months and rains, may be found at any time of the year, but seems to be confined to the hills and jungles from the sea upwards; it

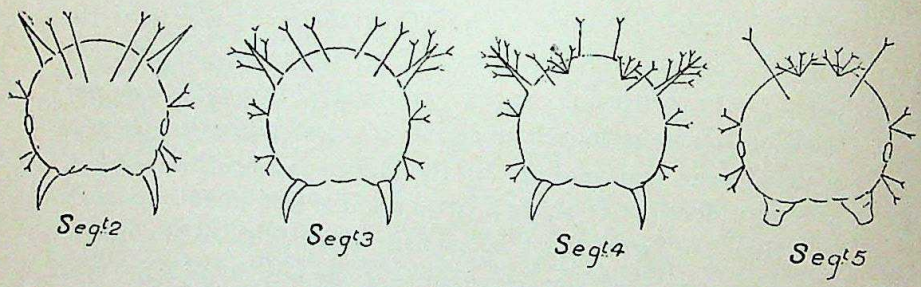
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

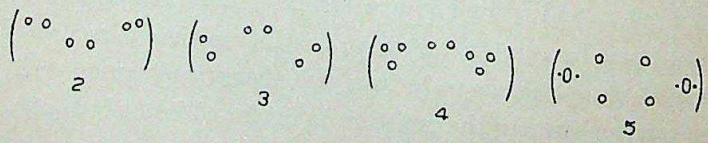
moves at all heights; rest, when drinking, with the wings closed over the back and has a skipping flight very similar to the next two species. It is found in Ceylon and Southern India in the hills and jungles. The foodplant of the larva is the anonaceous *Saccopetalum tomentosum*, Hooker, and *Unona Lawii*, Hooker, upon which it has been found; and doubtless other *Unonæ*.

There are many sub-species extending throughout India, Burma, into China, down through Tenasserim and the whole of the Malayan Region, to Australia; also north to Japan. *Papilio evemon* Boisd. from Malacca, Sumatra, Java, Borneo is very like it; also *P. procles*, Grose Smith, from North Borneo, and Kina Balu; *P. bathycles*, Zink, from Java, Sumatra, Borneo, Assam, Burma; *P. isander*, Godm. and Salv., from the Solomon Islands, &c., approaches *P. sarpedon*, L., forming the connecting link between it and *P. eurypylus* according to Rothschild.

Diagrammatic transverse sections of segments 2 to 5.



Papilio doson, 1st stage.



Papilio doson, dorsal plan.

94. Papilio sarpedon, *Lin.*—Male and female *upperside*: opaque black. Fore and the hind wings crossed from above the tornal area on the hind wing to near the apex on the forewing by a semi-hyaline, broad, pale-blue, medial band which is broadest in the middle, more or less greenish and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

macular anteriorly ; the portion of the band that crosses interspaces 6, 7, 8 on the hind wing white ; beyond the band on the hind wing there is a subterminal line of blue, slender lunules. *Underside* similar, ground-colour dark brown. Hindwing : a short, comparatively broad, subbasal band from the costa to subcostal vein, and the postdiscal area between the median blue band and the subterminal lunules velvety black traversed by the pale veins and transversely, except in interspaces 6 and 7, by narrow, crimson lines ; lastly, a crimson spot near the tornal angle with an admarginal yellowish-white spot beyond it. Antennæ, head, thorax and abdomen brown, the head and thorax suffused with greenish grey; beneath the palpi, thorax and abdomen touched with dingy white, the abdomen with two whitish lateral lines on each side. The male has the abdominal fold of hind wing grey within, furnished with a tuft of long, stiff, white hairs. Expanse 81-95mm.

Larva.—"The young larva is black or dark green, with numerous spines of which those on the metathorax are long and bristly ; when full grown, green, beneath lighter, with a pair of short spines on each of the three thoracic segments and on the last segment ; on the metathorax a yellow transverse band and from the metathorax to the anal segment a yellowish stripe above the legs ; on *Machilus oderatissima*, *Geijera salicifolia*, *Litsea*, *Alseodaphne*, *&c.*, and especially *Camphora officinalis*, where this tree has been imported. The yellowish egg is laid singly on the leaves and shoots of the food-plants." (*Dr. K. Jordan.*)

Pupa.—"Pupa green. the thoracic horn slenderer, more pointed and straighter than in the allied species, the lateral ridges extending downwards from the horn straight, between this carina and the frontal one a very slight, somewhat curved, vertical ridge."

De Nicéville gives a figure of the pupa in his paper "The Butterflies of Mussoorie," published at page 595 of Vol. XI of this Journal (the Journal of the Bombay Natural History Society), and says that the foodplant of the larva is *Machilus oderatissima*, Nees, Natural Order *Laurineæ*. He also states that the pupation takes place in June and the imago emerges in the following spring presumably because the climate up there in Mussoorie is very cold during the winter ; so that the butterflies behave like they do at home in England. *P. sarpedon* occurs throughout Continental India (except South India and Ceylon) to Java, the Philippines and Japan ; and has a subspecies, *semifasciatus*, Honr., in China.

95. Papilio teredon, *Felder* (Pl. D 5, fig. 30 ♂, 30*a* ♀ .—This is a slightly differentiated form of the above, distinguished in both sexes by the narrower medial band crossing both wings. The colour is brighter, the contrast between the green of the upper and the blue of the lower portion of the medial band more vivid. Hindwing more produced posteriorly at apex of vein 3 where it forms an elongate tooth or short tail. Expanse

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

74-90mm.; the males on the whole being about the same size as the females.

The last small spot of the wing-band just below the costa may be entirely wanting; indeed is generally wanting in the females from North Kanara.

Larva, 1st Stage. (*vide* figs. overleaf).—Shape: swollen in segments 3, 4, 5, thinning off to tail which is only half the width of segment 4. There is a large fleshy, supraspiracular tubercle on segments 3, 4, 14 which is dorsolateral on segment 2: the one on segment 2 being on front margin, that on segment 14 on hinder margin and the rest in centre of respective segments. These tubercles are long, conical, covered with little fine spines which are longly bifurcated at ends. There are four bifurcated shafts on front margin of segment 2; in a row between the dorsolaterals there is also a row of 4, similar shafts on segment 3 between the supraspiraculars; the same on segment 4: subdorsal and dorsolateral. On segments 4 to 12 there is a subdorsal, circular, ochreous tubercular spot set with 5 or 6 bifurcated shafts. On segments 5 to 12 there is a lateral tubercular spot with a single bifurcated shaft. On each segment 2 to 12 there is a supraspiracular tubercular spot with a short and a long bifurcated shaft and, under each spiracle, a similar spot also with two bifurcated shafts; and on the base of each proleg or in a corresponding region (where there is no proleg) a pair of similar bifurcated shafts. Segment 13 has the same arrangement of spots with shafts as the other segments. The spiracles are very small and black. The head is round, lightish brown-orange in colour, with a broad, dark band across from eyes to eyes; eyes are black; clypeus large, triangular; labrum, antennæ and jaws same colour as head, the last with tips dark. Colour of larva is green with the tubercles of segments 2, 3, 4 ochreous, those of segment 14 as well as that segment itself, white; a dorsal, sublateral and lateral brownish longitudinal band the whole length of larva; belly and prolegs white; true legs transparent white; all bifurcated shafts are black; the shafts of dorsolateral tubercles of segment 14 (tail points) are simple, not bifurcated. Segment 14 is flat and trapeze-shaped. L: 6mm.; B: 2mm. in broadest part without shafts.

2nd Stage.—The bifurcated shafts have all disappeared. The conical tubercles of segments 2 and 14 still exist but are now covered with simple, spinous hairs; the dorsolateral tubercles of segments 3 and 4 are very much shortened and similarly covered with hairs. The whole surface of the body is covered with fine, extremely minute, dark, pointed hairs. The head is round, orange, spotted darker, with the eyes brown. The colour of larva is dark olive-green, with the scars of the tubercular spots of 1st stage light; anal segment with tubercles thereof white; the subspiracular region whitish; a spiracular white line from segment 5 to segment 13; dorsolateral tubercles

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of segment 2, 3 and 4 shiny black. Spiracles light brown surrounded by a black line. Shape same as 1st stage. L: 12mm.; B: 4. 5mm.

3rd Stage.—Similar to the 2nd stage in every respect as to shape and spines and colour. The L: 15 mm.; B: 5-5mm.

4th Stage.—Similar to the 3rd stage in every respect except that the hairs covering the body are now mere indications showing as black pin-points, being hardly raised. There is an indistinct, lateral, longitudinal, white line from segment 4 to segment 13; a subspiracular line or narrow band, yellow. L: 19mm; B: 7mm.

5th Stage. (Pl. C. fig. 16).—The shape is the same as in the 4th stage except that the dorsolateral tubercles of segment 4 are triangular, flattened before and behind, shiny black at base and white on side, surrounded at base by a black line, the two tubercles connected across the segment by a distinct yellow ridge; the dorsolateral tubercles of segments 2 and 3 are similar in shape but considerably smaller: they are shiny and have a few minute hairs on them. The anal points are as in 4th stage. The head is green with a yellowish tinge with black eyes; covered with fine hairs which are light in colour. The body is likewise covered with extremely minute, light hairs. The colour is a fine rich green with segments 13 and 14, spiracular region, legs and prolegs greenish-white; there is a fine yellow lateral line and subspiracular yellow band from segment 6 to segment 13; the dorsolateral tubercles of segment 2 and 3 are white and black. L: 28mm.; B: 10 mm.; when stretched; L: 34mm.

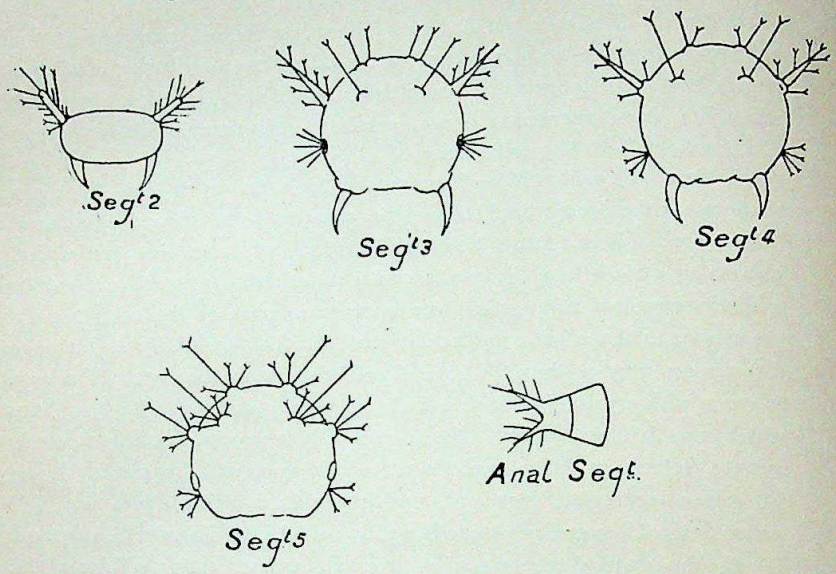
Pupa. (Pl. 1, fig. 13a)—Is very like that of *P. doson* in shape, except that here the thoracic process is at an angle of 45° to the longitudinal axis of pupa instead of 30°. Eyes prominent, with each a short point anteriorly, these points separated from the very slight dorsal ridge of head by a small sinus on each side of it; a ridge runs from the point of thoracic process down it on each side laterally, and in a curved line to the dorsal margin of wing along which it runs to about the middle of segment 8, being slightly thickened about the centre of the wing-margin; another ridge runs down the front of process and one posteriorly, the former continued down the dorsal line of head, the latter down the dorsal line of segments 4, 5 dividing into two diverging to become subdorsal, then lateral, gradually in an even curve, these two being widest apart about middle of abdomen whence they again converge to meet at base of cremaster; there is also a slight spiracular ridge from cremaster forward to thoracic process; but none of these carinations are pronounced; the shoulders are only slightly prominent and have each a short, low ledge at an angle to the plane joining spiracular lines; the cremaster is stout, square in transverse section, truncated at end and carinated down each of the four sides lengthways, continuations of the body carinæ. Surface minutely and shallowly rugose Spiracles of segment 2 not any way peculiar; others longly oval, small

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

colour of body. Colour rather light green, all the ridges light yellow. L: 31mm.; B: 10 5mm.; H: 8mm.; L: of thoracic process: 9mm.

Diagrammatic transverse sections of segments 2 to 5.



Papilio teredon, 1st stage.

Habits.—These are very much the same as for *P. doson*. The egg is deposited singly on the top of a leaf, generally a tough one, in a shady place in the jungles. It is of the usual type. The little larva eats the egg shell and makes a seat in the centre of the leaf, generally at the base, spinning copious white silk for the purpose. The full grown larva is very sluggish, walks slowly and haltingly and does not wander far to pupate. The change takes place generally on the underside of a leaf where the larva suspends itself with a strong tail-pad and a close body-string. The butterfly is probably the strongest and swiftest flying of the whole genus; it is generally seen sprinting along jungle paths or hurrying over low shrubs and up into the air over the foliage of the highest trees, keeping more to the open, in the sense that it does not dive amongst the undergrowth and into thick places, than any of the other swallowtails. It frequents flowers in much the same intermittent, restless way as the last species and forms one of the lot that visit damp sand and wet mud in the hot weather. It rests

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with the wings closed and may be found at any time of the year in the hilly forest regions of the Western Ghats in Bombay. It is a jungle species inhabiting the country at all levels from the sea up. The food-plants of the larva are belonging to the *Laurineæ* and it has been bred on *Cinnamomum zeylanicum*, Breyn, *Alseodaphne semicarpifolia*, Nees, *Litsea chinensis*, Lam., *Machilus macrantha*, Nees. Many of these are great big trees but the butterfly generally chooses small saplings or low shoots to lay on. *P. teredon* is confined to Southern India and Ceylon and is said to be found nowhere else.

Other *Subspecies* are *parsedon*, Westw., from Timor and other Malayan Islands, with a longer tail than *teredon*; *choredon*, Feld., from Australia and New Guinea with a broader band; *anthedon* Feld., from Amboina, Ceram, with large, strongly arched submarginal spots to hind wing; *milon*, Feld., from Celebes, &c., with all the spots of the band separated. *P. cloanthus*, Westw., from North India, Assam, Shan States and China has a fine subspecies *sumatranus*, Hagen, with a very broad, yellowish green band, occurring in Sumatra.

Habits.—The eggs are laid singly on young shoots, generally of small young trees or saplings, in shady places, and generally on the upper surface of leaves. The larva always lies on the upper surface in the centre of a leaf; when alarmed, it throws out a stiff, jelly-like process with a short base and two long diverging, cylindrico-conical branches of a light, translucent lemon-yellow colour from the membrance between the vertex of the head and segment 2; this process contracts into itself slowly when withdrawn; it smells strongly of the leaves of the food-plant when crushed —this organ is the osmeterium.

The coloured figure of male and female (figs. 30, 30a) on plate D5 show the upperside not black enough, the blue band perhaps too green, certainly not bright enough; there is too much red shade about it as usual. The same may be said of the undersides. The difference in length of the tail to hind wing in the two sexes is too much accentuated.

96. Papilio agamemnon, *L.* (Pl. D5, fig. 29).—Male *upperside*: black. Forewing with the following green markings: a spot at the extreme base of the costal margin, a transverse, short bar near base of cell and seven spots in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the cell beyond, two and two, except the apical spot which is single; two spots beyond cell-apex; a spot at base of interspace 1*a* and 1 followed by two, short, oblique, macular bands; a discal series of spots, decreasing in size towards the costa and a postdiscal series of smaller spots that begins with two in interspace 1; the spots in interspace 7 in both series are out of the line, placed outwards. Hindwing: three series of similarly coloured markings that run transversely across the wing more or less parallel to the dorsal margin, the upper markings, (these in interspace 7, that is) white; a short, greenish stripe at the extreme base of the wing. *Underside*: fuliginous brown or brownish black, more or less suffused with pink along the costal margin, on apical area and along the outer margin of the discal markings on the forewing, broadly along the dorsal and terminal margins and at base of interspaces 6 and 7 on the hind wing; markings similar to those on the upperside but less clearly defined and somewhat more grey in tint. Hindwing black, inwardly red-margined spots superposed on the pink area in interspaces 6 and 7. Cilia very narrow, pale pink. Antennæ, head, thorax and abdomen black; thorax above and the abdomen on the sides streaked with greenish grey; beneath ochreous grey, touched on the thorax with pink. Female similar, but with a streak of greenish white along the dorsal margin on both under and upper sides.—Expanse 90-102mm.

The ground-colour of the underside is somewhat variable; this, in some specimens, is much paler than in others and varies also in the amount of tint of pink suffusion. Burmese specimens generally have indications of a more or less complete series of red spots on the underside of the hindwing in continuation of the red spots at base of interspaces 6 and 7; in this they approximate to the Andaman and Nicobar race.

Larva.—Like that of *P. doson*. Head of the usual shape, large, green. The body is the same shape as that of *doson*: is swollen about segments 4, 5, decreasing perfectly regularly to the end, the sides of the body more or less perpendicular from the flattened ventrum; the thickest part is at segment 4; the anal segment is narrowed, more or less square at extremity, ending in two simple, curved, divergent spines which are separated at their bases by an interval equal to their own length; segment 2 has a dorsolateral simple, thin, pointed metallic blue-black spine on front margin which is 1·5 mm. in length; the two directed out in front and diverging one from the other; segment 3 has two similar, smaller, curved spines, one on each side, laterally and centrally; on segment 4 are two longer, similarly situated spines of 2 mm. in length (one to each side), from an orange spot. These spines are brittle and break off easily from the base. Surface of body smooth, dull, the segments well marked, though the margins are in no way constricted. Spiracles rather small, oval, black. Colour of body dull grass-green, obscurely blotched darker; a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

double white subspiracular line from segment 5 to anal end. The osmeteria are light yellow in colour. L : 38mm. ; B : 10mm.

Pupa.—Like those of *P. doson* and *P. teredon.*—Head very slightly convex across frons with two small, short, though prominent cones, one on each eye; segment 2 and head form together, seen from above, a square, slanting up from front of pupa at an angle of 75° with longitudinal axis of pupa to base of thoracic process; thorax little broader than segment 2, its front slope to base of process at an angle of 75° to the pupal length-axis; the process 2·75mm. long, stout (1mm. by 2mm.) laterally compressed, rounded at extremity projecting out in front, perpendicular to the front slope of thorax, continued dorsally backwards in a straight line with dorsum of abdomen, there being no constriction; the wings are expanded laterally into a narrow ledge; the abdomen is more or less square in transverse section and diminishes gradually in diameter to cremaster; the cremaster also square in section; surface of pupa finely rugose under the lens all over. Spiracles of segment 2 narrow brown slits; others rather round, moderately large, with a central oval inside which is a raised central slit, colour of the body. Colour grass-green with a row of darker green, subdorsal spots on abdomen; dorsal margins of wings lined with brown-red and slightly raised, the ridge thus formed running up to thoracic process, starting from front margin of segment 8; this red-brown marking is interrupted by an included small, white spot on the common margin of segments 6 and 7 and includes another white, triangular spot at front margin of segment 5 and another at the margin of segment 4: the apex of this latter spot is connected by a line with a prominent, horse-shoe shape ridge on the shoulder; edges of cremaster, four of them, white, the two upper ones being produced along sides of abdomen forwards to meet dorsally at anterior margin of segment 4; the other two white edges stop at segment 10. L : 29mm. ; B : 9mm.

Habits.—The oviposition, the shape, colour of egg are the same as for *P. doson.* When young the larva lives on the centre of the upperside of a leaf; when full grown hides in a similar position among the innermost leaves of the plant. It is subject to parasitic attack. The pupation takes place on the underside of a leaf, against a stalk or on a twig, the tail-fixing being strong, the body-loop fairly short. The butterfly is a fast, strong flier and is very fond of flowers; it has a skipping flight and keeps much to certain beats over bushes and low vegetation where it flies backwards and forwards in the hot sun. It is found in all sorts of country except the very dry regions and is fairly plentiful everywhere in India, both in the jungles and in the open, in the hills and in the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

plains. It does not go to water like the last few species; at least it is rarely met with amongst the drinking crowds in the nallas and on roads in the hot weather, though it may always be found at flowers all the year round in the Bombay Presidency; it flies earlier and remains later on the wing than any of the others. Like them, it is restless and is not easy to capture except at flowers. The foodplants of the larva are all anonaceous. It has been bred on *Saccopetalum tomentosum*, Hooker; *Anona squamosa*, L.; *A. reticulata*, L.; *Polyalthia longifolia*, Benth. and Hooker; *Unona discolor*, Vahl.; and doubtless feeds upon most *Anonaceæ*. *Anona* is the Custard Apple or *Sitaphal* of India. The distribution of *P. agamemnon* is more or less throughout India, Burma, extending to China and through the Malayan Region to the Philippines, and north to Japan. The subspecies *ligatus*, Rothsch., goes into Australia; *decoratus*, Rothsch., inhabits the Nicobars and Andamans; *salomomis* of the same author extends to the Solomon Islands.

In the coloured figure (fig. 29, Pl. 5), the whole thing is again too red in shade, the upperside is not black enough, the colouring of the underside not delicate enough.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SOME NEW INDIAN MAMMALS.

BY

R. C. WROUGHTON.

In a paper on the species of the Genus *Rhinopoma* (Ann. Mag. N. H., Vol. XI, p. 496, 1903), Mr. Thomas pointed out that Dobson had lumped two separate species of Egyptian *Rhinopoma*, differing markedly in size, under the name *microphyllum*, Brünnich. Blanford followed Dobson, and accepted the name *microphyllum* for the Indian form. He notes that the forearm measures 2·6 inches but adds "but many specimens are considerably smaller with a forearm of 2·1″ or less."

Among the specimens of *Rhinopoma* in the Cutch collection, of our SOCIETY'S MAMMAL SURVEY, from Bhuj, are representatives of two undoubtedly distinct species, with forearms about 60 and 70 mm. respectively. Either, therefore, we may hope to obtain a third species of the Genus, or Blanford was referring to the Arabian form, since named *muscatellum* by Mr. Thomas (l. c. supra), for there is no known *Rhinopoma* with such a short forearm as 2·1″=52·5mm. in India.

The smaller specimens are undoubtedly *hardwickii*, while the larger, though resembling *sumatræ*, Thomas, in size, are separable as a distinct species, which I propose to call:—

RHINOPOMA KINNEARI, * sp. nov.

A large *Rhinopoma*, about the size of *R. sumatræ* with broader ears and broader, stouter skull.

Fur short, 3-4 mm. on the back. General colour above brownish-drab, warmer in colour than the drab-grey of *hardwickii*; below paler. Face in front of ears, ears, and lower back, naked; in *sumatræ* the fur of the back is continued almost to the root of the tail. Ears broad, 15 mm. (12 mm. in *sumatræ*.)

Skull.—Broad and stout, strongly crested, inter-orbital ridges well marked, a marked transverse ridge on each side, immediately above the nostril, sides of mesopterogoid fossa sub-parallel,

* Named in honour of the Society's hard working Curator, Mr. N. B. Kinnear.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

anterior end of fossa rounded, extending to level of front of posterior molar (in *sumatræ* the fossa is markedly broad posteriorly, its margins converging sharply anteriorly, the anterior apex not reaching the last molar). Anterior nasal opening markedly larger than in *sumatræ*.

Dimensions of the Type (recorded by the Collector).—Head and body 80; tail 63; forearm 70; ear 21.

Skull.—Greatest length 22·5 (19, 21·2); basal length, 19·5, (15·5, 18·2); zygomatic breadth, 13·5 (11·3, 12·8); breadth of brain case, 9·5 (9, 9·2). Front of canine to back of m^3, 8 (6, 5·8).

(NOTE.—The dimensions in brackets are those of the type skulls of *hardwickii* and *sumatræ* respectively.)

Habitat.—Bhuj, Cutch.

Type.—Adult male. B. M. No. 11·12·11·1. Original No. 458. Collected 28th August 1911, by Mr. C. A. Crump and presented by the Bombay Natural History Society to the National Collection.

The following is a key to the known species of *Rhinopoma*.

KEY.

A.—Tail shorter than forearm, skull with a transverse ridge, on each side, immediately above the nostril.

a. Size larger, forearm 70-73 mm.

a'. Ears narrower, 12 mm.; fur of back extending almost to the root of the tail (Sumatra) ... ... *sumatræ*, Thos.

b'. Ears broader, 15 mm.; lower back naked (Cutch) .. .. *kinneari*, sp. nov.

b. Size smaller, forearm 65-67 mm. (Egypt) ... ... *microphyllum*, Brünnich.
= *lepsianum*, Peters.
= *cordofanicum*, Heuglin.

B.—Tail longer than forearm; skull with a globular swelling on each side above the nostril.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a. Size larger, forearm 57-61 mm. (India). *hardwickii*, Gray.
b. Size medium, forearm 52-55 mm.
(Egypt)... ... ... *cystops*, Thos.
c. Size larger, forearm 49-50 mm.
(Arabia) ... ... *muscatellum*, Thos.

When comparing some Pipistrelles collected by Mr. Crump with the series in the National Collection, I found some specimens in the latter which are easily separable from *Pipistrellus mimus*, of which they are the northern representatives. I propose to give them the name :—

PIPISTRELLUS MIMUS GLAUCILLUS, subsp. n.

The northern dwarf Pipistrelle.

A pipistrelle scarcely differing from *mimus* except in size and colour.

Size rather larger than *mimus*, but tail slightly shorter. Fur as in *mimus*. General colour above 'mouse grey' (near 'bistre' in *mimus*), individual hairs grey, with whitish tips; below, as in *mimus*, the hairs are brownish black with long whitish tips; giving a silvery effect on the belly. The ears on the average longer and the tail shorter than in *mimus*.

Skull with the braincase rather shallower, otherwise quite as in *mimus*.

Dimensions.—Head and body 48; tail 28; forearm 29; ear 12.

Habitat.—Multan, Punjab.

Type.—Adult male. B. M. No. 10·1·18·15. Original number 328. Taken on 18th July 1909 by Major H. N. Dunn. R.A.M.C., and presented to the National Collection.

Major Dunn took four specimens at Multan and one at Umbala. They are very even in colouration, and, when mixed in a long series of true *mimus*, may be picked out at a glance. They are no doubt the northern representatives of *mimus*.

I received lately for identification, from the Society, a specimen of a Leggada from Lahore, presenting certain skull characters which seemed to show that it held, to some extent, the position

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with regard to *Leggada* which *Pyromys* (Vol. XX, p. 996) does to *Epimys*. A closer examination of the series of *Leggada* obtained by Mr. Crump in Cutch, showed that these too (which are undoubtedly *L. sadhu*) had the same formation of the skull and could not therefore be a local race of *platythrix*. Amongst these undoubted specimens of *L. sadhu*, however, are some which, while showing the same mammary formula, are smaller in size and have the peculiar skull formation of *sadhu* less well developed.

I propose to describe them as :—

LEGGADA CINDERELLA, sp. nov.

The Cutch Spiny Mouse.

A *Leggada* of the *sadhu* type with a mammary formula of 4-2=12, but of smaller size, and having the mesopterygoid fossa narrowed anteriorly but the posterior nares not, or scarcely, closed over.

Size slightly smaller than in *sadhu*. General colouring differing but little from that of that species, *viz.*, drab grey above and pure white below.

Skull markedly smaller, with the mesopterygoid fossa narrowed anteriorly but the posterior nares not, or scarcely, roofed in.

Dimensions of the type (recorded by the Collector).—Head and body 85; tail broken, but judging from proportions in other specimens about 67; hind foot 16; ear 13.

Skull.—Condylo-basal length 22 (25); basilar length 19 (21); zygomatic breadth 6 (7·5); nasals 9·5 (10); diastema 6 (7·5); upper molar series 4 (4·5).

Habitat.—Cutch State. (Type from Bhuj.)

Type.—Old female. B. M. No. 12·1·9·12. Original No. 321. Collected, 27th July 1911, by Mr. C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

Mr. Crump obtained 8 or 9 specimens, some of them at the same places in which he took *L. sadhu*.

The peculiar formation of the mesopterygoid region in the skulls of *sadhu* and *cinderella*, though it has not been recorded in an Indian *Leggada*, is well known in some African forms, where it varies in definition in various species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The Cutch Porcupine proves on examination to differ from the Dekhan form. I propose to call it :—

HYSTRIX CUNEICEPS, sp. nov.

The Rajputana Porcupine.

A porcupine of somewhat smaller size than *leucura*.

Externally differing but little from *leucura* except in size, and a somewhat paler colouring, especially about the head and neck.

Compared with *leucura*, the skull is markedly smaller and narrower and its greatest breadth is across the squamosal, instead of across the maxillary roots of the zygoma, as in the former. Bullæ noticeably smaller.

Dimensions of the type.—Head and body 680 ; tail 88 ; hind foot 86 ; ear 42.

Skull.—Condylo-basal length 145 (155); basilar length 131 (139) ; zygomatic breadth, at the level of the back of the nasals 72 (85); the same at the level of the back of the parietal 78 (80); length of nasals on median line 71 (80) ; anterior breadth of nasals 33 (35) ; posterior breadth of nasals 34 (46) ; braincase breadth 51 (61); diastema 42 (49) ; postero-anterior length of bullæ 18 (20) ; molar series 34 (32).

Habitat.—Cutch and Rajputana. (Type from Nokania, Cutch.)

Type.—Adult male. B. M. No. 12·1·9·11. Original number 261. Collected on July 14, 1911, by Mr. C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

The skull dimensions given in brackets above are those of an adult male of *leucura* from Khandesh, which, I am satisfied, by comparison with Sykes' type, is true *leucura*.

There is, in the National Collection, a specimen from Rajputana which, except that it is younger, appears to agree in all characters with the present form, and I have therefore proposed the name "Rajputana Porcupine."

In a collection from the Nimar District, made by Mr. C. A. Crump, under the auspices of our Mammal Survey Fund, is a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

single specimen of a mouse, which is so different from anything recorded, that I propose to describe it under the name of

MUS PHILLIPSI.

Phillips' Spined Mouse.

A small mouse, slightly larger than *Leggada booduga*. Coat composed almost entirely of coarse spines, coarser even than in *Leggada platythrix*, overlying an underfur of shorter colourless hairs.

General colour.—Above, 'drab,' tinged with blackish brown on the back, individual spines of the back pale silvery grey, with rather long (2-3 mm.) dark brown tips; below, pure white, hands and feet white, tail coloured like the back, slightly paler below, well clothed with stout, bristly hairs, which are long for the size of the animal. Footpads 6 as in *Mus*, the granulations of the sole, so characteristic of *Acomys*, entirely absent.

Skull markedly larger than in *Leggada booduga*, about as in the common Indian House-Mouse. The frontal ridges strongly marked, as in *Leggada platythrix*, but diverging more abruptly, in passing backwards from the interorbital region than in that species, so that, seen from above, the parieto-frontal area seems almost 'pyriform,' instead of evenly broadening backwards as in *L. platythrix*, and still more in *Mus 'manei.'* The dentition is quite that of true *Mus*, the anterior molar being longer than the other two together, and at the same time lacking the forward prolongation of the anterior molar, with its crowning cusp, which characterizes *Leggada*. The palatal foramina reach backwards barely beyond a line joining the anterior edges of the first molars, while in *Mus manei* they extend backwards at least to one-third of the length of the first molar, and in *L. platythrix* to nearly two-thirds.

Dimensions of the type measured by the Collector.—Head and body, 79; tail, 60; hind foot, 14. (The ears of the specimen have unfortunately been eaten off by ants.)

Skull.—Condylobasal length, 21·5; basilar length, 18; greatest breadth, 11; nasals, 9; diastema, 6·5; upper molar series, 3·7.

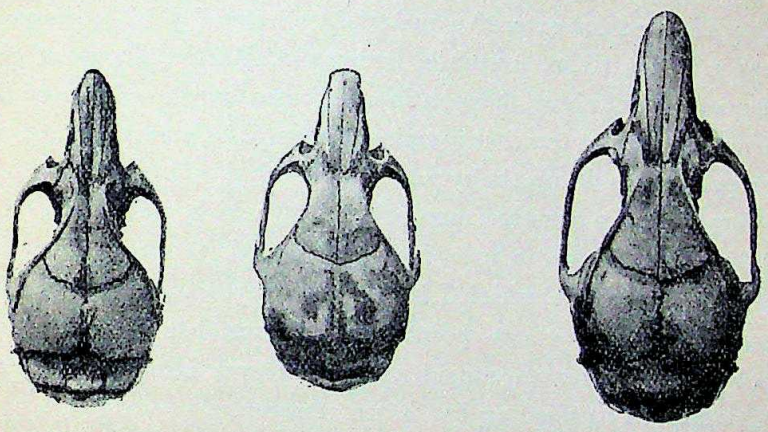
Habitat.—Nimar District, C. P. (Type from Asirgarh. Altitude 1,500.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Type.—Old male, B. M. No. 12, 3, 2, 1 (Original Number 618). Collected 26th October 1911, by Mr. C. A. Crump, and presented to the National Collection by the Bombay Natural History Society.

This interesting little jungle mouse is separable at once from any form of *Mus* or *Leggada*, recorded from India, by its coat, composed entirely of coarse spines, giving it a strong superficial resemblance to *Acomys*, to which however, as shown by its skull and dentition, it is in no way related. It would be most interesting to know the mammary formula of this species, *i.e.*, whether it has 10 mammæ, like *Mus* or 12 like *L. platythrix*.



1 2 3

No. 1.—*Mus phillipsi.*
No. 2.—*Mus manei.*
No. 3.—*Leggada platythrix.*

The above figures show the skull differences in the three species, the absence of the frontal ridges differentiating *Mus manei* from the other two, and the size and shape of braincase separating *M. phillipsi* from *L. platythrix*.

I have much pleasure in naming this well-marked new species after Mr. R. M. Phillips, D. S. P., Dharwar, who has given such whole-hearted assistance to our Collector.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

TERMITES FROM BRITISH INDIA (BOMBAY) COLLECTED BY DR. J. ASSMUTH, S.J.

BY

NILS HOLMGREN (STOCKHOLM).

(With Plates A, B, C and D.)

After WASMANN in 1903 published his paper on "Termiten, Termitophilen and Myrmecophilen gesammelt auf Ceylon von Dr. W. Horn, 1899, etc.," the termite fauna of India seems to have been lost sight of by termitologists. WASMANN'S Treatise on the Termites of the Continent of India (contained in the above named paper) is based on extensive material collected by his correspondents in India, Heim, Assmuth, Redemann, Martin, Hoogwerf, and others. As will always happen in such cases, our knowledge of the different species of termites remained incomplete, and it has not yet been possible to fill up the gaps.

As regards the termite fauna of Ceylon, which was dealt with by WASMANN in the paper just mentioned, the collections of Escherich and Green, which I have worked up, have completed our knowledge of it in several points, and the number of species has thereby been increased considerably; however here, too, several gaps remain to be filled up by future research.

As for the termites of the Indian Continent our knowledge of them has been enlarged somewhat by DESNEUX'S description of some termites of Sind.

The latest valuable contribution to this subject comes from Dr. Assmuth, who, I am glad to see, has again begun collecting in the neighbourhood of Bombay and who sent me last year a rich collection (57 tubes) of Bombay termites. There is, it is true, but one new species in the collection, which however is most valuable as completing in a large measure our knowledge of the Indian termites, both as regards the different castes and their several habits.

The following species in British India had been known already:—

Fam. PROTERMITIDÆ, Holmgr.

Hodotermes macrocephalus, Desn.; all castes.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Fam. MESOTERMITIDÆ, Holmgr.

Leucotermes indicola, Wasm.; smaller soldier, worker.
Coptotermes Heimi, Wasm.; imago.

Fam. METATERMITIDÆ, Holmgr.

Termes Estherae, Desn.; all castes.
Odontotermes obesus, Ramb.; all castes.
,, *obesus*, subsp. *wallonensis*, Wasm.; all castes.
, *brunneus*, Hag.; imago.
,, *Horni*, Wasm.; soldier.
Microtermes incertus (?), Hag.; soldier and worker.
,, *sindensis*, Desn.; imago.
,, *mycophagus*, Desn.; all castes.
Microcerotermes Heimi, Wasm.; all castes.
Hamitermes quadriceps, Wasm.; soldier and worker.
,, *Belli*, Desn.; all castes.
Eurytermes Assmuthi, Wasm.; all castes.
Capritermes incola, Wasm.; all castes.
Eutermes biformis, Wasm.; all castes.
,, *Heimi*, Wasm.; all castes.
,, *rubidus*, Hag.; all castes.
Anoplotermes (*Speculitermes*) *cyclops*, Wasm.; imago and worker (*i.e.*, all castes).

Our information about three of them has been enlarged by Assmuth's latest collection which contains the following:—

Leucotermes indicola, Wasm.; imago and larger soldier.
Coptotermes Heimi, Wasm.; soldier and worker.
Odontotermes brunneus, Hag.; soldier and worker.

New for the Indian continent is:—

Odontotermes Feae, Wasm.; soldier, larger and smaller worker (the latter of which is at the same time new to science).

The following is a new species:—

Microtermes obesi, n. sp.; imago.

It is a striking fact that the collection contains no *Protermitidae* whatever.

Though the number of new forms thus discovered is not large, still Assmuth's collection is all the more valuable, as he has

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

added to each number more or less detailed notes on the habitats, etc., which are without doubt among the best I have received from my correspondents. The notes are so instructive and have been made so carefully as to enable me to publish them here with hardly any change. Assmuth is likewise responsible for the photographs 1-7 which are reproduced with this article.[1]

Fam. **MESOTERMITIDÆ**, Holmgr.

Subfam. LEUCOTERMITINÆ, Holmgr.

Gen. LEUCOTERMES, Silv.

Leucotermes indicola, Wasm., 1903.

IMAGO.—Almost identical with that of *Leucotermes ceylonicus*, Holmgr. Antennæ, however, of 16-17 segments (in *L. ceylonicus* of 15 segments). Ocelli generally absent (in *ceylonicus* they are punctiform). Length with wings 9 mm. (in *ceylonicus* 10 mm.).

LARGER SOLDIER.—Very nearly the same as that of *L. ceylonicus*, but antennæ of 15 segments (in *ceylonicus* of 14).

SMALLER SOLDIER AND WORKER.—See WASMANN, 1903. Cf. also HOLMGREN : Ceylon-Termiten, in : ESCHERICH, Termitenleben auf Ceylon, 1911.

Collector's Report :—

BOMBAY, 15-6-1911.—"From the chemical laboratory of St. Xavier's College, room on ground floor; the termites seem to have come out from underground and had almost completely eaten up several boxes of dealwood of which they are specially fond." (Assmuth.)

KHANDALA, 6-6-1911.—"Caught by lamplight in room. Seem to be rather rare in this place and not to occur in larger swarms as is otherwise the case with these termites, since I saw only two or three specimens." (Assmuth.)

Note.—From the above remarks it appears that *L. ceylonicus* and *L. indicola* are very closely allied to, yet different from, each other. The differences are, however, so small as to allow the two

[1] Assmuth begs on this occasion to give expression to his deep sense of gratitude to the authorities of St. Xavier's College without whose generous aid the many excursions necessary for collecting the material would have been impossible, and also to Mr. J. P. Mullan, M.A., Assistant Professor of Biology at St. Xavier's College whose able help is responsible for much of the success achieved.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

kinds to be characterised as distinct races only. I have nevertheless kept them separate, because the interest which attaches to them is precisely based on the slight diversity, not on the similarity of their structure. Both species are in all probability so-called geographical forms of *Leucotermes tenuior*, Hav., from Sarawak.

Subfam. **COPTOTERMITINÆ**, Holmgr.

Gen. COPTOTERMES, Silv.

Coptotermes Heimi, Wasm.

IMAGO.—With regard to the tables printed in Zool. Anz. Vol. XXXVII, p. 552, I wish to remark that the measurements of *Coptotermes Heimi* are somewhat larger than stated there and, consequently, nearer to those of *Coptotermes ceylonicus*—

	C. travians, Hav.	*C. Heimi*, Wasm.	*C. ceylonicus*, Holmgr.
Breadth of head ..	about 1·2 mm.	1·3-1·4 mm.	1·4-1·5 mm.
„ „ pronotum ..	„ 1·05 „	1·2-1·3 „	1·3-1·4 „
Length „ „ ..	„ ·6 „	·7 „	·8 „

SOLDIER.—Scarcely different from *Coptotermes travians*, Hav., *ceylonicus*, Holmgr. and *formosanus*, Shir. In *Coptotermes travians* the antennæ are of 14 segments, in the other species of 15.

Measurements.[1]

	C. travians, 4 specimens.	*C. ceylonicus*, 5 specimens.	*C. Heimi*, 10 specimens.	*C. formosanus*, 10 specimens.
Length of head (without mandibles).. ..	1·25-1·36	1·11-1·29	1·29-1·44	1·41-1·48
Breadth of head..	1-1·16	1·03-1·17	1-1·15	1·04-1·22
Breadth of pronotum	·73-·78	·66-·9	·74-·81	·78-·85

[1] The tables on p. 192 in "Termitenleben auf Ceylon" are incorrectly printed—see the tables given above.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

WORKER.—Same as in *travians*.

Collector's report :—

BOMBAY, 15-3-1911.—Imagines. "Caught by lamplight in room." (Assmuth.)

25-4-1911.—"Termites on footpath behind St. Xavier's College. Had probably been thrown on the road from one of the neighbouring houses or gardens. . . ." (Assmuth.)

20-8-1911—"From St. Mary's College, Bombay (Mazagon) found in room in wooden shelves partly eaten up by termites, and in garden in front of room in stump of tree. Unfortunately specimens from both places mixed up together in same tube by the Collector, Rev. Schurhammer; but possibly both parties belong to the same species." (Assmuth.)—Both are, in fact, of the same species.

Fam. **METATERMITIDÆ**, Holmgr.

TERMES SECTION.

Gen. ODONTOTERMES, Holmgr.

Media of forewing arising from Cubitus. Third segment of antennæ shorter than second.

Odontotermes obesus, Ramb.

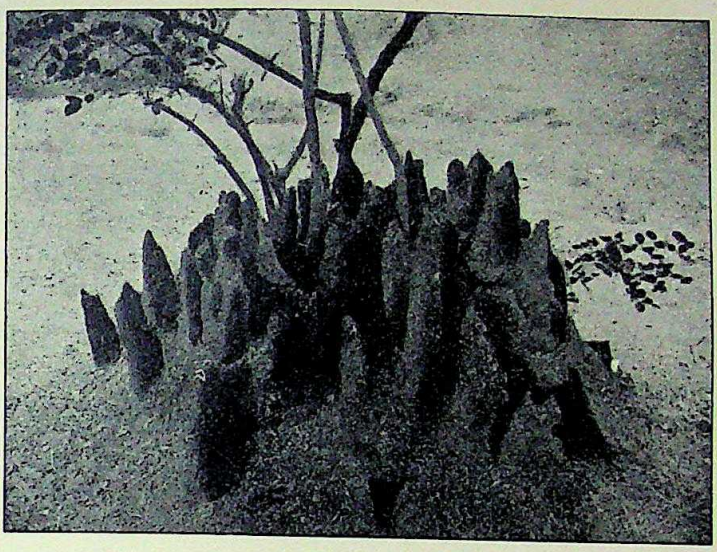
Specimens from numerous colonies and nests are at hand. As stated previously by WASMANN, the species varies rather considerably in size, and also a little in appearance. At first I was inclined to assign the specimens sent to me to two different species; but a closer examination of the material seems to show that the various forms are nothing but different biological types of the same species; for I have been able to insert between the two abovementioned forms an intermediary one containing qualities of both. I propose to name these three forms *Odontotermes obesus a*, *b* and *c*.

Odontotermes obesus a :—Length of head of soldier 1·85-2 mm., breadth of head about 1 mm., length of body about 3·7 mm. Labrum reaching to one-half the length of mandibles. Salivary glands not very well developed.

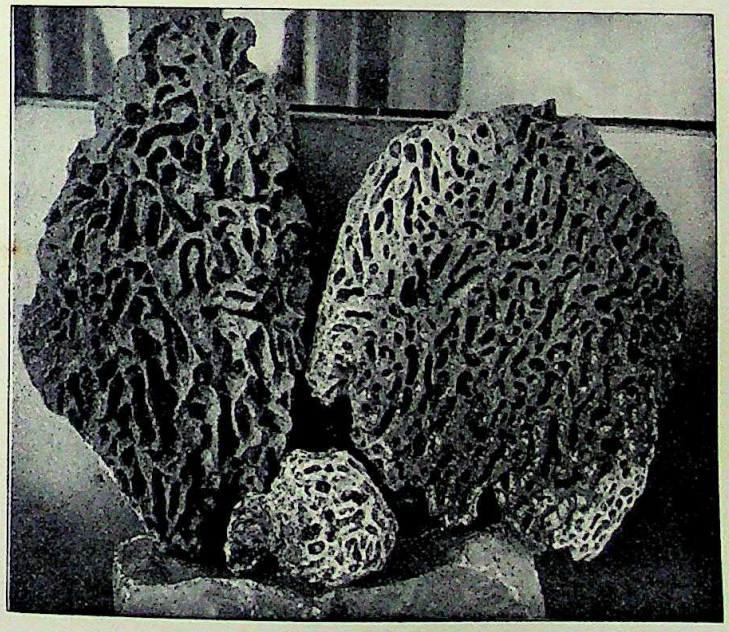
Odontotermes obesus b :—Length of head (soldier) 1·96-2·03 mm., breadth of head 1·11 mm. approximately, length of body 4·25-4·5

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



I.—TYPICAL NEST OF *Odontotermes obesus* RAMB. form *a* (Holmgr.).



II.—FUNGUS-BEDS OF THE SAME.

TERMITES FROM BRITISH INDIA.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

mm. Labrum reaching to either one-half, or one-third only, the length of mandibles. Salivary glands same as in *a*.

Odontotermes obesus c:—Length of head (soldier) 2-2·33 mm., breadth of head about 1·33 mm., length of body 5·25-5·4 mm. Labrum reaching to one-third only the length of mandibles. Salivary glands very strongly developed. (Different from *Odontotermes obesus wallonensis*, Wasm.)

Collector's report:—

Odontotermes obesus a.

KHANDALA, 21-1-1911.—"In dry half-burnt twigs and other vegetable remains, which, after being covered with friable galleries of red soil, had—as far as thus covered—been eaten up by termites. Soil used for building galleries evidently not so well cemented with secretions from salivary glands as is otherwise done by *Termes obesus*." (Assmuth.)

21-1-1911.—"Pretty tall mound at foot of bush on low slope." (Assmuth.)

26-2-1911.—"Smaller mound crowned by turrets, constructed on hillside in midst of shrubs." (Assmuth.)

26-2-1911.—"Middle-sized mound at foot of high tree." (Assmuth.)

26-4-1911.—"Hillock nearly 6 feet high leaning against a tree. Two queens, but only one king taken in nest." (Assmuth.)—Imagines of *Microtermes obesi*, n. sp., found in same nest.

22-5-1911.—"Mound built on slope by side of mountain path. Nest deserted, probably pillaged by ants. Fungi grown to long thick white stalks of 10 mm. and more in length. No termites in fungus beds, only a small number of them found in narrow passages constructed in pillars of nest. Nest therefore pillaged in all probability but a short time before. No queen nor royal cell either to be found." (Assmuth.)

22-5-1911.—"Big nest on slope at bottom of shrub, the roots of which were found traversing every part of nest. Fungus beds of strangely bluish colour (in other cases simply brown). Though only small part of nest examined, yet 260 guests taken." (Assmuth.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

25-5-1911.—"Mound on hillside in bushes." (Assmuth.)

BORIVLI JUNGLE (SALSETTE ISLAND), 25-3-1911.—"In dry tree-trunk completely hollowed out by termites."

5-4-1911.—"Nest under bamboo shrubs on slope. Upper height of nest (*i.e.*, measured from highest point where mound and slope met,) 1·25m. above ground, lower height more than 2m. Exterior form and fungus beds as on photos 1 and 2." (Assmuth.)

5-4-1911.—"Nest with broad cupolas at foot of high Targola palm. Fungus beds as on photo 4; as, however, one *Termitoxenia Assmuthi* was taken; I rather think the species to be the common *Termes obesus*. Also some other guests taken in the nest point to the just mentioned species." (Assmuth.)

5-4-1911.—"Termites under stone." (Assmuth.)

Aberrant form of a nest.

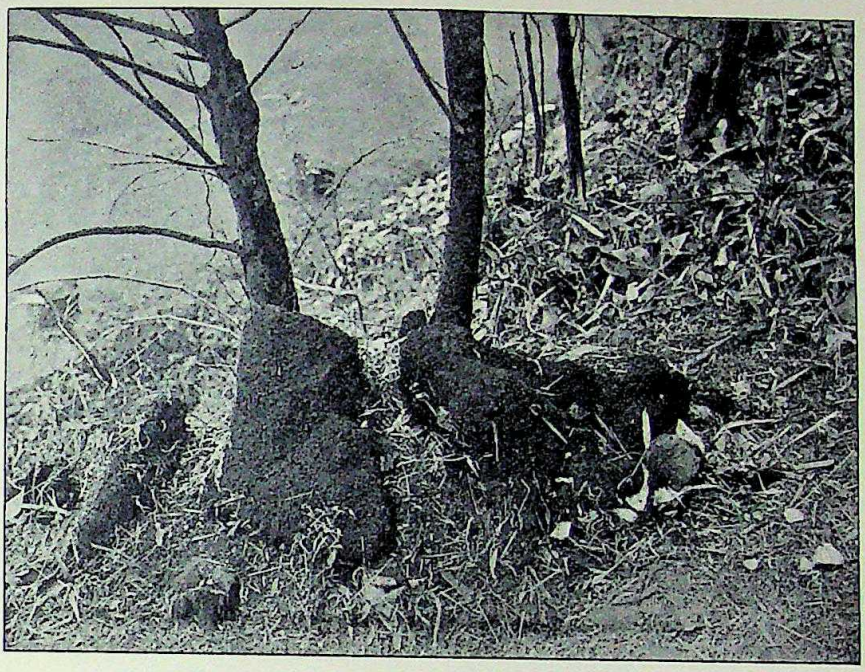
KHANDALA, 1-5-1911.—"Pretty tall mound on slope, between two trees. Interior of nest quite full of large and small stones, hence most of fungus beds not conical as usual, but some flattened out, others almost cubiform, their forms just fitting into spaces left here and there between stones." (Assmuth.)

Odontotermes obesus b.

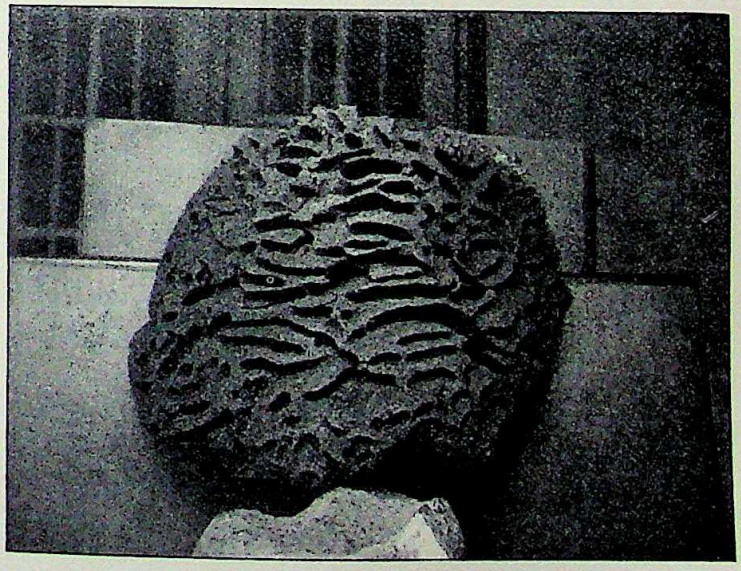
KHANDALA, 2-6-1911.—"Nest on bank of water-course which had dried up after monsoon; river bank about 3 feet high. Upper structure of nest consisting of several very low cupolas each completely separated from the other, the highest of them rising not more than 20 cm. above ground. None of the cupolas showed any perforation, their surface was not smooth, but looked quite weather-worn; in all cupolas an amount of dry grass was found embedded. (Cp. photo 5.) King as well as Queen found after long search, in quite unlooked-for place, about 1 m. from edge of bank and 40 cm. below surface. Though interior of nest showed exceptionally large hollows, yet fungus beds contained therein very small, looking rather like fragments than complete structures. The roof of the beds is a continuous (with large cracks when dried up), slightly convex layer pierced with a number of small holes for the passage of termites (photo 6). *Termitoxenia Assmuthi* in nest which would suggest *Termes obesus*; structure

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



III.—NEST OF *Odontotermes obesus* RAMB. form *c* (Holmgr.).



IV.—FUNGUS-BEDS OF THE SAME.

TERMITES FROM BRITISH INDIA.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of nest, however, altogether different from last named species." (Assmuth.)

Odontotermes obesus c.

KHANDALA, 24-4-1911.—"Termites under stone." (Assmuth.)

31-5-1911.—"Nest on small plateau near steep hillside. Upper structure of nest rather small, consisting of four or five blunt peaks (photo 3). The latter completely riddled with holes, just like nests found near Kirkee (*Odontotermes brunneus*, Hag.; see below); their structure, however, not so regularly semiglobular. Fungus beds consisting of a number of more or less parallel layers supported by a good many partitions, the whole arranged in much the same way as in Kirkee nests (photo 4). No queen found. Secretions of biting soldiers as strongly staining as those of *Odont. brunneus.*

N. B.—Examined under pocket-lens, the perforation of the peaks of photo 3 is clearly recognizable." (Assmuth.)

7-6-1911.—"Nest of same structure as preceding." (Assmuth.)

10-6-1911.—"Nest on open ground near coriander-shrub. Fungus beds and outer structure same as described above under *Odont. ob. b.* Diameter of surface area of nest between 2 and 3 m., on which I counted about ten rather broad but very low substructures crowned by some sixty small elevations (photo 5); the highest of the latter rose no more than 20 cm. above ground." (Assmuth.)

BORIVLI JUNGLE (SALSETTE ISLAND), 5-3-1911.—"Mound built round base of tree. Perhaps *Termes obesus*, but fungus beds apparently somewhat different from common type (cp. photo 2), rather like photo 4." (Assmuth.)

25-3-1911.—"Mound without turrets at foot of tree. Fungus beds similar to photo 4." (Assmuth.)

5-4-1911.—"Nest with rather broad blunt cupolas, lying by itself on slope by roadside. Fungus beds pretty near type represented on photo 4." (Assmuth.)

Note.—A typical nest of *Odontotermes obesus* is shown in photo 1. Its overground portion consists of a somewhat semiglobular structure, from which rise a number of more or less pointed turrets.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The diameter of this nest is 2·35 m.; the height of the semi-globular structure, without turrets, averages 56 cm.; highest turret measured from roof of substructure, 55 cm.; total height of nest which was situated on a slightly inclined plane, 85 cm. on more elevated side of slope, 110 cm. on lower. Mantle of nest not perforated.

From this normal type the nests of *Odont. ob. c* differ considerably; for the pointed turrets are in this case replaced by small *roundish* cupola-like prominences, the mantle of which is wholly perforated. Moreover the fungus beds within the nest show quite a different formation. If we add to this that the soldiers are a little larger than those of the *a*-nests, with shorter labrum and more strongly developed salivary glands, we should, it would seem, be quite justified in considering the occupants of the *a*-and *c*-nests as two distinct species.

However, this view is contradicted by *Odontotermes obesus b*, the soldiers of which occupy an intermediate position between *a* and *c*, since in *b*-colonies *a*-and *c*-soldiers are found promiscuously. The structure of nest is likewise peculiar in group *b*; its distinctive features are the numerous small prominences or cupolas (cp. with the many turrets of *obesus a*) of low elevation (as in *c*) and completely separated (as in *c*); perforation is absent (as in *a*).

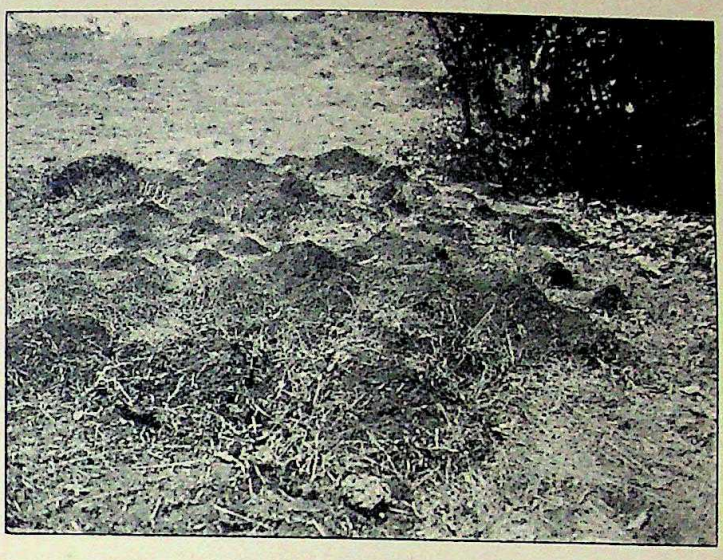
The fourth *c*-nest (examined 10-6-1911; cp. above) is also opposed to the abovementioned view; for it shows the same build as the *b*-nest. Its occupants, however, belong to *O. obesus c*.

The conclusion, therefore, is that the three forms of *obesus* are not entirely distinct biological types; but, as far as I am at present able to judge, the forms merge into one another with regard to their morphological character as well as the structure of their nest.

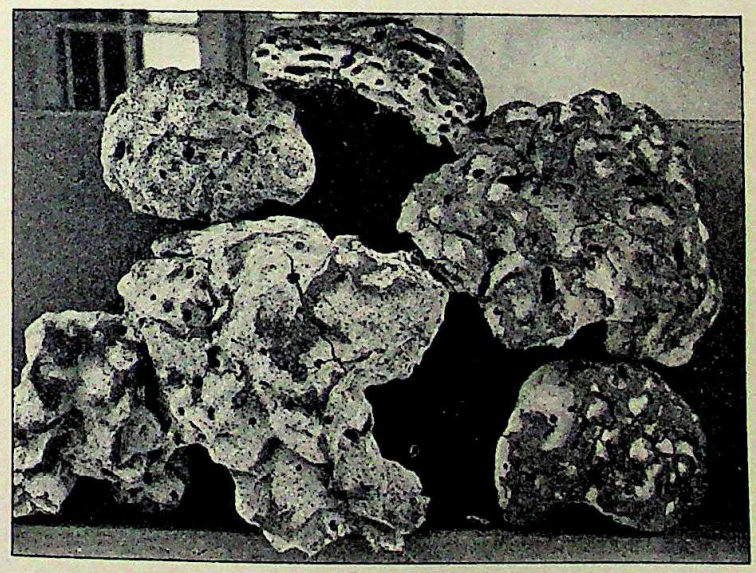
It is certain, according to Assmuth's information, that *O. obesus* belongs to those species of *Odontotermes* which (like *O. ceylonicus* and *O. Horni*) use secretions of their salivary glands as means of defence.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



V.—NEST OF *Odontotermes obesus* RAMB. form *b* [as well as *c*] (Holmgr.).



VI.—FUNGUS-BEDS OF form *b*.

TERMITES FROM BRITISH INDIA.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Though our knowledge of the nests of *Odontotermes* is still somewhat defective—we have so far heard nothing of their general plan of construction nor do we know in what manner fungus beds, nursery quarters, etc., are generally arranged—we may nevertheless compare them with the mounds of the closely allied species *Odontotermes Redemanni*. The fresh, newly built nests of the latter remind one forcibly of the young nests of *O. obesus*, the number of their (*O. Red.*) cones, however, being smaller. Later on even these few cones disappear, the intervening spaces between them being filled up by the workers. As an architect, therefore, *O. Redemanni* seems to have proceeded a step further than *O. obesus*. "Chimneys" are never found in nests of *O. obesus*, whereas with *O. Redemanni* they seem to be of rather common occurrence. Now since the nests of *obesus* are quite as large as those of *Redemanni* it stands to reason that the "chimneys" met with in *Redemanni*-nests, though they *may* also serve the purpose of ventilators, are not primarily built for this end; ventilation is, on the contrary, only their secondary function; for surely ventilation would be as necessary for *O. obesus* as for *Redemanni*. Like TRÄGÅRDH, I believe the "chimneys" rather to be passages for transport used by the termites when building nests. They may possibly be found also in fresh nests of *O. obesus*; but this is not at all necessary, since mound-making termites may quite well build nests without constructing any "chimneys" (cp. nests of *Syntermes*).

Odontotermes brunneus. Hag.

IMAGO.—For description see HAGEN, Monographie der Termiten, 1858.

SOLDIER.—Closely resembling *O. ceylonicus*, Wasm., but somewhat larger, with broader head, and mandibles showing a sharper curve. Antennæ of 17 segments, 4th segment longer than 3rd. (In *ceylonicus* of 16 segments, 4th shorter than 3rd). Left mandible, just beyond middle, with large tooth. Tooth of right mandible in same position but small (in *ceylonicus* rudimentary). Labrum rounded off at tip (in *ceylonicus* pointed). Pronotum deeply bilobed anteriorly (in *ceylonicus* slightly bilobed). Head brown-red, dorsal side of abdomen brownish (in *ceylonicus* head yellow-red,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

abdomen whitish). Antennæ brown with rings of light colour (in *ceylonicus* whitish).

	O. brunneus, Hag.	*O. ceylonicus*, Wasm.
Length of abdomen	5·5-6·3 mm.	5·5-6 mm.
„ „ head with mandibles.	2·96 „	2·85 „
„ „ „ without mandibles	1·85 „	1·74 „
Breadth of head	1·41 „	1·29 „
„ „ pronotum	1·11 „	1 „

WORKER (two sizes).—Head faintly brownish-yellow (in *ceylonicus* yellow). Antennæ of 18-19 segments[1] (in *ceylonicus* of 16-17 segments[2]), towards the tip brownish (in *ceylonicus* whitish). Pronotum bilobed anteriorly (same in *ceylonicus*).

	Larger worker.		Smaller worker.	
	O. brunneus.	*O. ceylonicus.*	*O. brunneus.*	*O. ceylonicus.*
Length of abdomen	5 mm.	4·5 mm.	4 mm.	3·5 mm.
Breadth of head...	1·48 „	1·37 „	1·04 „	·92 „
„ „ pronotum..	·85 „	·78 „	·74 „	·55 „

Collector's report :—

KHANDALA, 21-1-1911.—"In dry cowdung completely perforated and traversed with tunnels by termites. Outer surface of cowdung, and partly also inner wall of tunnels, scantily coated with red earthy material, as is done by many termites when constructing galleries. Nest proper not found." (Assmuth.)

KIRKEE, 9-5-1911.—" Nest rising about 3 feet above ground, built in garden against brick wall.—The overground portion of

[1] In large workers usually of 19 segments, in small ones always of 18.
[2] „ „ of 17 „ „ of 16.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nests of this species consists of a tolerably solid, more or less semiglobular, base-structure which, however, is apparently not so much impregnated with salivary secretions and consequently not hardened to such a degree as the corresponding part of *obesus*-nests. It rises sometimes as high as 4 feet above ground (in one case I measured even 6 feet) and is crowned by a number of rounded (not pointed as the turrets of *obesus*) domes or cupolas of the height of 1 foot or so. The domes, which are not solid but riddled all over with small holes, are of poor consistence so that one can easily crumble them between the fingers; the holes serve as passages for the termites. The colour of the soil used for constructing the mounds of this species round Kirkee is black (that of *obesus* at Khandala reddish-brown).—Three queens taken in this nest, each enclosed in separate cell; these cells built close together, about 2 feet above ground. No king found in any of the cells, but this failure perhaps to be accounted for by lack of time which made careful search impossible. The fact that queens' chambers were all situated so high above ground makes me believe that the three queens taken by me were received into nest only a couple of years after its foundation, the original royal pair probably having their quarters lower down in nest. I opened merely upper portion of mound, so no chance to come across primitive royal chamber. Fungus beds similar to photo 4. Soldiers when biting secrete drop of milky fluid like those of *O. obesus*; but quantity of liquid secreted by *O. brunneus* more abundant and consequently brown spot appearing on skin after liquid drying up, larger as well as more lasting. Photo 7 shows palm of my right hand taken 4 days after examining this nest. It was only 6 days later that the spots finally disappeared." (Assmuth).

10-5-1911.—"Low mound on flower-bed in garden. Queen about half a foot below surface of ground." (Assmuth).

13-5-1911.—"Mound of moderate size standing by itself in garden. Royal cell with king and queen in middle of nest, level with surrounding ground." (Assmuth).

15-5-1911.—"Very small young nest at foot of babul tree. Queen, with abdomen of strikingly white colour, and king taken." (Assmuth).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

15-5-1911.—"Tall mound on open space in small babul-wood. King and queen.—As regards guests taken in this and preceding nests (*Termitoxenia Heimi*, Wasm., *Corythoderus gibbiyer*, Wasm., *Chaetopisthes Heimi*, Wasm., etc.), the species tallies well with *Odontotermes obesus*, subsp. *wallonensis*, Wasm." (Assmuth.)

POONA, May 1911.—"Collected from mounds by S. G. Gadgil, Esq., M. A." (Assmuth).

Note.—This species, though doubtlessly very close to *O. ceylonicus*, is, nevertheless, as stated above, well differentiated from it. Biologically the two kinds represent in all probability two different types inasmuch as *O. brunneus* builds mounds of its own, whereas *ceylonicus*, according to ESCHERICH, appears to live as an inquiline in nests of *O. Redemanni* and *obscuriceps*; so far, at any rate, no mounds built by *ceylonicus* have been recorded.

Odontotermes Feœ, Wasm.

IMAGO.—Not known.

SOLDIER.—For description, see *Wasmann*, Neue Termitophilen und Termiten aus Indien, 1896.

I make the following additions:—Soldier very like that of *O. Horni*, Wasm. Head, however, more narrowed anteriorly; mandibles shorter and somewhat weaker; tooth of left mandible placed more towards middle, that of right, central, rudimentary; labrum longer, covering half the length of mandibles. Pronotum distinctly bilobed anteriorly.

Length of body	... ...	7-8-9 mm.
,, ,, head with mandibles	...	3·7 ,,
,, ,, ,, without mandibles	...	1·74 ,,
Breadth of head	... ...	2·07 ,,
,, ,, pronotum	... ...	1·59 ,,

LARGER WORKER.—Close to worker of *O. Horni*. Fontanelle distinct, but not brown. Antennæ of 19 segments, third shorter than second, yet somewhat longer than fourth. Pronotum slightly bilobed anteriorly. Pilosity plentiful.

Length of body	... ...	6 mm. (WASM. 5 mm.)
Breadth of head	...	1·92 mm.
,, of pronotum	...	1·15 ,,

SMALLER WORKER.—Antennæ of 17 segments, third very short

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

shorter than fourth, but equal in length to fifth. Pilosity abundant. Pronotum very little bilobed anteriorly.

Length of body ...	...	4 mm.
Breadth of head...	...	1·15 ,,
,, of pronotum ...		·81 ,,

Note.—This species may possibly prove to be merely a race of *O. Horni* of Ceylon.

Collector's Report :—

KHANDALA, 21-1-1911.—"Termites in room where they had eaten up books and woollen goods[1] after covering them with friable crust of red soil. Room on ground-floor; termites had come up from underground through crack in cemented pavement." (Assmuth.)

7-5-1911.—"Termites in flower pot into which they had found their way, as it had probably been standing in garden over underground nest. Narrow tunnels interrupted at short intervals by small extensions or "chambers"—the size of the latter generally not exceeding that of a monkey-fig—found all through mould in flower pot. Inner walls of tunnels rough, neither smoothed, as with *Odontotermes*, nor blackened, as with *Eutermes biformis*." (Assmuth.)

25-5-1911.—"Under stone in deep ravine." (Assmuth.)

8-6-1911.—"Under stone the surroundings of which clearly showed that this is one of the several kinds of white ants which, during night, cover the surface of ground in neighbourhood of nest with friable galleries and more or less extensive coatings of red earthy material; the termites then eat what they have covered—dry grass, leaves, wood, etc.,—and only as much of it as they have covered, leaving any portions outside the crust untouched." (Assmuth.)

Gen. MICROTERMES, Wasm.

Microtermes obesi, n. sp.

IMAGO.—Very close to *M. sindensis*, Desn.; chiefly differentiated from this species by the dimensions which are somewhat smaller

[1] It is remarkable that cotton goods lying in same shelf were covered by termites with galleries, but otherwise left altogether intact.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in *M. obesi*. The total length of the latter, however, as well as the length of its wings is greater. Colour and pilosity either the same as in *M. sindensis*, or colour somewhat lighter. Compound eyes medium-sized (in *sindensis* small). Ocelli big, but little removed from compound eyes (in *sindensis* of middle size, distant from eyes by half their diameter or more). Antennæ of 15 segments. Pronotum relatively small; anteriorly, in the middle, very little bilobed, but distinctly so posteriorly (in *sindensis* insignificantly). Wing membrane with short hair only in outer half (in *sindensis* whole wing sparsely hairy). Wing at tip somewhat pointed (in *sindensis* rounded off).

	M. obesi, n. sp.	*M. sindensis*, Desn.
Length with wings	15·5 mm.	14 mm.
„ without wings	9-10 „	8-9 „
„ of forewings	12 „	11 „
„ of head	1·41 „	1·78 „
Breadth of head	1·29 „	1·44 „
„ „ pronotum	1·29 „	1·41 „
Length of „	·78 „	·92 „

Habitat.—KHANDALA, 26-4-1911.—Taken in nest of *Odontotermes obesus a*, Ramb.

Microtermes (?) incertus, Hag.

It is a discovery of WASMANN (1902), which I am now able to corroborate to some extent, that *Microtermes incertus*, whose original home is presumably Africa, occurs also in India near Bombay; for in the collection before me there are two tubes containing soldiers as well as workers of the *Microtermes* group. They do not differ perceptibly from *Microtermes incertus*, Hag., save that the pilosity of the soldiers' head is a trifle denser and perhaps stiffer than in *incertus*. However this difference is so vague that I dare not attribute any importance to it.

It is, therefore, not impossible that *Microtermes incertus* is met

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with in India; still it seems rather surprising seeing that this species is so far known only from Mozambique and Natal. However I do not believe that the resemblance of the soldiers in question with those of *M. incertus* necessarily implies the identity of both kinds. To substantiate my view I shall draw a parallel between the imagines of some African and Indian species. The winged individuals of *M. Trägärdhi* and *M. sindensis* show hardly any difference at all, and their soldiers, I think, will be very nearly alike. Again, *M. incertus* and *M. obesi* differ hardly in any other respect but the number of segments of their antennæ, there being 16 in *incertus*, 15 in *obesi*. The two species are consequently very closely related, which leads me to believe that their soldiers and workers cannot be much different either. It seems to me highly probable that the soldiers and workers before me belong to *M. obesi*, since part of them was found with *Odontotermes obesus* in the same locality as the imagines described above.

Collector's Report :—

KHANDALA, 2-6-1911.—"Termites the galleries of which were constructed in a nest of *O. obesus* form *b*." (Assmuth.)

8-6-1911.—"Under stone." (Assmuth.)

MICROCEROTERMES SECTION.

Gen. MICROCEROTERMES, Silv.

Microcerotermes Heimi, Wasm.

Tallies in all castes with co-types from WASMANN'S collection as well as with Ceylon specimens received from GREEN.

Collector's report :—

BORIVLI JUNGLE (SALSETTE ISLAND), 5-2-1911.—"Spherical nest. Proved by experiment that material of which nest is made burns well when put in fire.—I have been unable to discover any regular layers such as shown by you (HOLMGREN, 1906) to exist in South American termite-nests built of wood-carton. The nest of *Microcerotermes Heimi* which is made of extremely hard woody material, presents a pretty uniform labyrinth of small chambers which are connected by minute holes piercing the partitions, just sufficiently large to allow the termites to pass through. The outer surface is here and there covered with patches of a thin crust of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

reddish earthy material; the royal cell is situated rather more downwards, not in the centre. Eggs are, of course, found in greater quantities in chambers in the neighbourhood of the royal cell, but I could not convince myself that they were limited to a definite space which might rightly be termed a "zone".—Number of workers, as is always the case in this species, very great, that of soldiers rather small." (Assmuth.)

25-3-1911.—"Spherical nest of very tough woody material. Nest not perfectly spherical, but somewhat elongate. Greater axis 24-28 cm., smaller 15-20 cm. Nest built just above surface of ground on withered bamboo-stump, as is apparently the rule with this species." (Assmuth.)

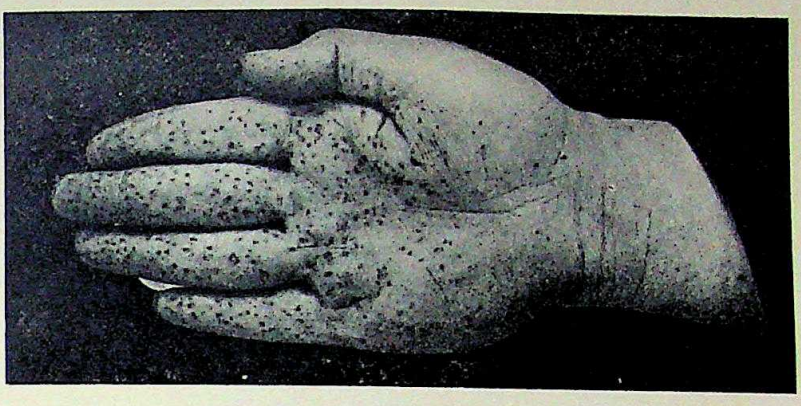
5-4-1911.—"Spherical nest. Fully developed queen in royal cell, but no king. The latter, in fact, never found in any of the many nests examined. In a number of nests of this species the royal cell was found, but no queen in it, though nest was otherwise crammed full of termites." (Assmuth.)

5-4-1911.—"Spherical nest containing double (two-storied) royal cell, the one situated above the other, both separated by simple flat partition forming ceiling of lower, and bottom of upper, cell, pierced with a fair number of small holes for passage of workers and soldiers. No fewer than 13 queens, but no king. Though queens here of different size, yet all of them smaller than those found singly in other nests. Dimensions of nest about the same as stated above." (Assmuth.)—Assmuth is right in believing that the queens are neoteinic; the species consequently belongs—together with *Armitermes neotenicus*, Holmg.—to those which construct special chambers for the neoteinic individuals.

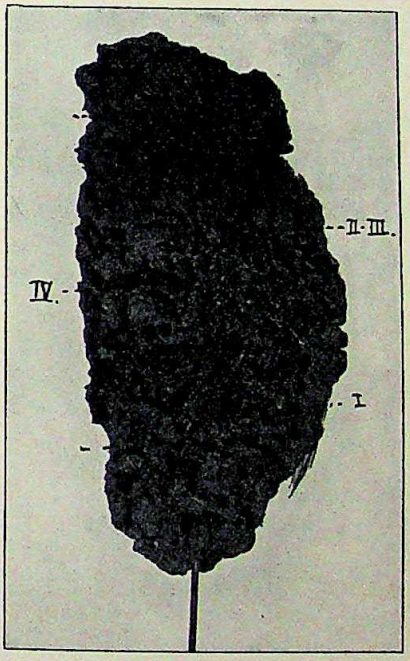
Note.—The build of *Microcerotermes* nests might perhaps be taken as a proof that they have followed a line of development different from that of the *Eutermes*-nests of South America which I have described. The study of portions of nests of *M. papuanus* and *M. Biroi* from New Guinea, which I made some time ago, convinced me that such was the case. This fact can not be surprising, since *Microcerotermes*, morphologically, belongs to quite another line of descent than *Eutermes*; and, as a matter of fact,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



VII.—HAND COVERED WITH BROWN SPECKS FROM BITES OF SOLDIERS OF *Odontotermes brunneus* HAG.



VIII.—SECTION THROUGH PART OF NEST OF *Microcerotermes Heimi* WASM.

I—Coating zone; II and III—Outer zone (not differentiated);
IV—Nursery zone (central zone absent).

TERMITES FROM BRITISH INDIA.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the portions of the nests just mentioned do not show an arrangement in layers analogous to what we observe in *Eutermes*-nests. This being the case, it would be highly remarkable if a *Microcerotermes*-nest was really discovered in which an arrangement in layers or zones similar to that of *Eutermes*-nests could be shown to exist; for the practice of building such a type of nest would doubtlessly be the result of parallel lines of development.

Now Assmuth has sent me two portions of the second nest mentioned above (see collector's report); one of the fragments—the more interesting of the two—a piece 7·5 cm. thick, is taken from the outer part of the nest, the other is the innermost portion of it with the royal cell. To my surprise I recognise in the first fragment a distinct stratification, *viz.* 1. A coating zone (zone I; cp. HOLMGREN, Studien ueber suedamerikanische Termiten, 1906), consisting of very minute pellets of earthy material, the exterior of which is not smoothed. The zone is irregularly rough and warty, forming the outside wall of the external layer of cells or chambers. 2. An outer zone (zone II and III). This layer contrasts with the interior of the nest by its very colour, its walls being lined with a sort of brownish-black coating of excrements, whereas the walls of the interior are lined yellowish-brown. Moreover, the chambers of this zone are, on the whole, smaller than those of the interior. They also seem to extend in a more tangential direction, at least in the lower portions of the zone in question. The latter is not built regularly, nor is the form of its cells well definable in all parts; but the colour of its interior lining enables us to fix its limits without any difficulty. The thickness of the layer is about 3 cm. 3. A nursery zone (zone IV.) Its walls are lined with a yellowish-brown coating. The chambers, though very irregular, show a more or less marked horizontal position. Round the royal cell their arrangement appears to be somewhat concentric, but without any regularity. The queen is found in this layer in a big (3-4 cm. broad) rather flat-roofed chamber with perforated walls. A central zone (Zentralkern) would, therefore, seem to be absent.

The general build of the nest appears from the accompanying photograph (No. 8).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Hence I am of opinion that, in the case of the *Microcerotermes*-nest under discussion, a stratification has been proved to exist which is substantially the same as in the nests of the *Syntermes*-*Eutermes*-section. It may well be supposed that such a conformity goes back to primeval conditions, and hence it is likewise conceivable that the case before us is the expression of instincts of nest-building which had been developed even in the *Mesotermitidæ*. But when we examine the construction of nests of the *Mesotermitidæ* as it appears to-day, we find concentric nests only in the *Coptotermitinæ*, a subfamily which can nowise be considered as the starting point of development either for the *Syntermes*—or the *Microcerotermes*-section. Our present knowledge of the *Mesotermitidæ*, then, proves that neither for *Eutermes*—nor *Microcerotermes*-nests a common form of concentric nests can be pointed out as the primitive type. Consequently we must for the time being assume that the conformity of stratification in the nests of the above-named sections is based on parallel development of the instincts of nest-building.

HAMITERMES SECTION.

Gen. HAMITERMES, Silv.

Subgen. SYNHAMITERMES, n. subg.

Hamitermes (Synhamitermes) quadriceps, Wasm.

I have before me both soldiers and workers.

Collector's Report :—

KHANDALA, 31-5-1911.—"Termites the flat broad tunnels of which were constructed in the pillars of a nest of *O. obesus* form *c*." (Assmuth.)

Note.—The new subgenus *Synhamitermes* will be defined later on in my "Termitenstudien." I include in it, together with *H. quadriceps*, *H. brevicorniger* from South America.

MIROTERMES SECTION.

Gen. CAPRITERMES, Wasm.

Capritermes incola, Wasm.

Soldiers as well as workers are in my possession; they do not differ from Ceylonese specimens.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Collector's Report :—

KHANDALA, 22-5-1911.—"Tunnels in pillars of nest of *O. obesus* form *a*." (Assmuth.)

10-6-1911.—"Under stone." (Assmuth.)

SYNTERMES SECTION.

Gen. EUTERMES, Fr. Mueller.

Eutermes biformis, Wasm.

Tallies perfectly with specimens from Ceylon.

Collector's Report :—

BORIVLI JUNGLE (SALSETTE ISLAND), 5-4-1911.—"In small galleries built on surface of bare ground." (Assmuth.)

KHANDALA, 4-5-1911.—"Under broad stone on top of mountain, approximately 2,700 feet above level of sea. Inner walls of tunnels as well as lower side of stone with deep-black grained surface, like shagreened leather." (Assmuth.)

4-5-1911.—"Nest near preceding one, under stone. The whole mountain (Fernhills) apparently occupied by this species; I found the termites under nearly every stone I turned." (Assmuth.)

29-5-1911.—"Under stone in deep ravine." (Assmuth.)

29-5-1911.—"Under stone not far from preceding nest." (Assmuth.)

2-6-1911.—"Nest under stone. This is the only case in which I observed a *Eutermes*-nest having some sort of overground structure—a clod of dry mud beside stone covering main nest was traversed by numerous black-coated galleries so characteristic of *Eutermes biformis*. The clod was about 10 cm. high and had a surface diameter of 20-30 cm." (Assmuth.)

2-6-1911.—"Under stone close by preceding nest." (Assmuth.)

Note.—Previously known from Ceylon as well as Bombay.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A MONOGRAPH OF THE WASPS OF THE GENUS *CERCERIS* INHABITING BRITISH INDIA.

WITH NOTES ON OTHER ASIATIC SPECIES.

BY

ROWLAND E. TURNER, F.Z.S., F.E.S.

(Continued from page 516 of this Volume.)

PART II.

(With Plates C & D.)

Cerceris pruinosa Morice.

Cerceris pruinosa Morice Trans. Ent. Soc. London, p. 303, 1897. ♀.

♀. Pallide flava, vertice mesonotoque nigro-maculatis; flagello segmentisque abdominalibus apice anguste ferrugineis; clypeo dimidio apicali subconcavo, angulis producto; segmento ventrali secundo area basali elevata lata; segmento mediano area basali nitida.

Long. 10 mm.

♀. Clypeus about half as broad again at the apex as long, the apical half subconcavely depressed, widely and shallowly emarginate on the apical margin and produced at the angles. Antennæ inserted a little further from the anterior ocellus than from the base of the clypeus, second joint of the flagellum scarcely longer than the third. Posterior ocelli as far from the eyes as from each other. Pronotum depressed in the middle; mesopleuræ without tubercles. First abdominal segment broader than long; the raised area at the base of the second ventral segment broad; pygidial area ovate, much broader at the base than at the apex. Shallowly and sparsely punctured on the dorsal surface of the thorax, more closely and deeply elsewhere; the enclosed area at the base of the median segment smooth, but not highly polished, with a median groove. Fifth ventral segment widely emarginate at the apex. Wings hyaline; first recurrent nervure received before one-third from the base of the second cubital cell.

Habitat.—Quetta (*Nurse*). July.

Originally described from Abbasiyeh in Egypt; also taken by Mr. Eaton at Biskra, Algeria.

Cerceris spectabilis Rad.

Cerceris spectabilis Rad. Horæ Soc. Ent. Ross. XX, p. 36, 1886.

♀. Flava; abdomine incisuris ferrugineis; flagello testaceo; vertice, mesonoto, areaque basali segmenti mediani nigris; clypeo supra dimidium

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

apicalem subimpresso, apice truncato, mesopleuris tuberculo acuto, segmento ventrali secundo area basali haud valde elevata, segmento mediano area basali nitido ; alis hyalinis, apice leviter infumatis.

♂. Feminæ similis ; abdomine incisuris nigris, clypeo latitudine fere sesqui longiore, apice truncato.

Long. ♀ 7 mm., ♂ 6 mm.

♀. Clypeus flattened or feebly impressed from before the middle to the apex, the apical margin broadly truncate. Antennæ inserted almost as far from the base of the clypeus as from the anterior ocellus, the second joint of the flagellum less than half as long again as the third. Posterior ocelli further from the eyes than from each other, the eyes slightly divergent towards the clypeus. Mesopleuræ with an acute tubercle; first abdominal segment as long as broad ; second ventral segment with a feebly raised area at the base. Pygidial area nearly twice as long as the greatest breadth, rounded at the apex, the sides almost parallel. Head and thorax finely and sparsely punctured; the enclosed area at the base of the median segment shining, divided by a longitudinal groove ; the sides of the median segment, mesopleuræ and abdomen coarsely and rather closely punctured. First recurrent nervure received before one-third from the base of the second cubital cell.

♂. Clypeus nearly half as long again as broad, truncate at the apex ; mesopleuræ without a spine ; first abdominal segment longer than broad ; pygidial area nearly half as long again as broad.

Habitat.—Quetta (*Nurse*). July.

Cerceris pulchella Klug.

Cerceris pulchella Klug. Symb. Physic., 1845. ♂ ; Schlett. Zool, Jahrb, II, p. 391, 1887. ♂, ♀.

♀. Flava, macula circa ocellos, mesonotoque nigris ; flagello, pygidio, segmentisque dorsalibus basi pallide ferrugineis ; alis hyalinis, apice infuscatis ; clypeo convexo, apicem versus triangulariter truncato, mesopleuris tuberculatis, segmento ventrali secundo area basali elevata, area basali segmenti mediani nitida.

Long. 10 mm.

♂. Flavus, vertice, mesonoto, area basali segmenti mediani, segmentisque abdominalibus basi nigris ; flagello pallide ferrugineo ; clypeo latitudine sesqui longiore, apice truncato.

♀. Clypeus convex, with a small oblique triangular truncation at the apex, the middle lobe as long as broad and truncate at the apex. Antennæ inserted high up on the front, as far from the base of the clypeus as from the anterior ocellus, the second joint of the flagellum less than half as long again as the third. Cheeks not quite as broad as the greatest breadth of the eye. Mesopleuræ with a distinct tubercle ; first

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

abdominal segment as long as broad; second ventral segment with a raised area at the base; pygidial area pyriform, much narrowed at the apex. Head and thorax finely punctured, thorax and median segment shining and very sparsely punctured; the triangular area at the base of the median segment smooth and shining, with a shallow median groove; abdomen more strongly punctured. First recurrent nervure received just beyond one-third from the base of the second cubital cell.

♂. Middle lobe of the clypeus about half as long again as broad, truncate at the apex, slightly convex. Antennæ inserted a little nearer to the anterior ocellus than to the base of the clypeus. First abdominal segment longer than broad by about one quarter; pygidial area as broad at the base as long, narrowed to the apex, where it is not more than two-thirds of the breadth at the base, the apical margin truncate. More strongly punctured than the female, especially on the thorax and median segment; the triangular area at the base of the median segment as in the female. The first recurrent nervure is received just before one-third from the base of the second cubital cell.

Habitat.—Quetta (*Nurse*).

Originally described from Egypt.

I feel confident that this is the species described as *pulchella* by Schletterer, but do not consider that his identification is beyond doubt. A specimen in the Oxford University Museum, collected by Captain Boys, seems to be identical in structure and sculpture but differs remarkably in colour; the ground colour being black without any ferruginous markings, and the yellow bands on the abdomen are reduced in size and differ in shape.

Cerceris dentata Cam.

Cerceris dentata Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 260, 1890. ♀.

♀. Nigra; clypeo, fronte, scapo, macula pone oculos, pronoto, tegulis, mesopleuris macula, scutello utrinque, postscutello, segmento mediano linea lata utrinque, segmento abdominali primo macula parva utrinque, segmentis secundo tertioque fascia angusta apicali, quinto fascia lata tibiis tarsisque flavis; segmento abdominali primo femoribusque ferrugineis; alis hyalinis, apice vix infumatis; clypeo concavo, apice late truncato; mesopleuris dentibus binis approximatis armatis; segmento mediano area basali nitida, sparsissime punctata; segmento ventrali secundo area basali elevata.

Long. 8 mm.

♀. Clypeus broad, concave on the apical two-thirds, broadly truncate at the apex. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum more than half as long again as the third. Eyes diverging very slightly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

towards the clypeus; posterior ocelli a little further from the eyes than from each other, and further from the posterior margin of the head than from the eyes. Mesopleuræ with two stout teeth placed close together; first abdominal segment as long as broad; second ventral segment with a raised area at the base; fifth ventral segment widely emarginate at the apex; pygidial area ovate, twice as long as the greatest breadth. Rather deeply punctured; more closely and finely on the head; enclosed area at the base of the median segment smooth and shining, with very few large punctures and a well marked median groove. First recurrent nervure received just beyond one-quarter from the base of the second cubital cell.

Habitat.—Barrackpore (*Rothney*). According to Bingham also from Poona.

Cerceris quettaensis Cam.

Cerceris quettaensis Cam. Ann. and Mag. Nat. Hist. XX., p. 85., 1907.

♀. Nigra; clypeo, fronte, scapo, macula post oculos, rapronoto utrinque, mesopleuris maculis duabus, tegulis, postscutello, segmento mediano utrinque pedibus, segmento secundo dorsali fascia basali tertio quintoque fere totis, quarto fascia antice late emarginata, segmentisque ventralibus 2-5 flavis; clypeo dimidio apicali impresso, apice truncato; mesopleuris spinis duobus acutis; segmento mediano area basali nitido; alis hyalinis, apice leviter infuscatis; segmento ventrali secundo area basali elevata.

Long. 13 mm.

♂. Feminæ similis; clypeo latitudine paullo longiore, apice truncato, mesopleuris tuberculatis.

Long. 12 mm.

♀. Clypeus a little broader than long, broadly truncate at the apex, the apical half very slightly concave. Antennæ inserted fully half as far again from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum nearly half as long again as the third. Mesopleurae with two acute spines; first abdominal segment as long as broad; second ventral segment with a raised area at the base; pygidial area broadest at the base, half as long again as the greatest breadth, rather narrowly rounded at the apex. Coarsely punctured, the space at the base of the median segment smooth and shining, with very short striæ at the sides, divided by a deep longitudinal groove. First recurrent nervure received before one-third from the base of the second cubital cell.

♂. Clypeus a little longer than broad, truncate at the apex. Antennæ inserted as far from the base of the clypeus as from the anterior ocellus, the apical joint not curved and no longer than the penultimate. Mesopleuræ with two tubercles, the posterior one acute, but not as long as in the female. First abdominal segment longer than broad.

Habitat.—Quetta (*Nurse*). May.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Cerceris comberi sp. n.

♀. Flava; vertice, mesonoto, areaque triangulari segmenti median nigris; flagello, segmento dorsali primo, secundo apice quartoque basi rufis alis leviter infuscatis; clypeo apice fere transverso, ante apicem transverse impresso, segmento ventrali secundo area basali elevata.

Long. 12 mm.

Clypeus concave, broadly truncate or subemarginate at the apex, with a transverse depressed line before the apex. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the third joint of the flagellum as long as the second. Head broad, the cheeks broader than the greatest breadth of the eyes, without a spine. Eyes diverging towards the clypeus. Pronotum not depressed in the middle, the posterior angles prominent; mesopleuræ without spines. First abdominal segment almost quadrate, second ventral segment with a small raised area at the base; fifth ventral segment raised broadly on the apical margin, with a deep depression before the raised space; pygidial area broad, less than twice as long as the greatest breadth, slightly broadened to the middle and rather broadly truncate at the apex. Closely but not very deeply punctured: the enclosed area at the base of the median segment obliquely striated at the sides, almost smooth in the middle, the median groove broad and transversely striated. First recurrent nervure received a little before the middle of the second cubital cell.

Yellow; the vertex, ocellar region, mesonotum, extreme apex of the scutellum and the enclosed area at the base of the median segment black; an oblique yellow band on each side on the vertex; flagellum, first dorsal segment, apex of second segment broadly and the base of the fourth segment more obscurely pale rufo-ferruginous. Wings dusky fulvo-hyaline stained with fuscous at the apex.

♂. The ferruginous colour on the second and fourth dorsal segments is replaced by black, which is sometimes also the case in the female; the clypeus is longer than broad, convex at the base, truncate at the apex; first abdominal segment nearly twice as long as broad.

Habitat.—Karachi (*Comber*). October. Mysoore (sic) Oxford University Museum, ex. coll. Westwood.

This seems to be very near *histrionica* Klug, but the petiole of the male is longer in the present species according to Klug's figure.

Cerceris albopicta Sm.

Cerceris albopicta Sm. Ann. & Mag. Nat. Hist. (4) XII, p. 412, 1873.

♀. Nigra; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, mesopleuris maculis duabus, segmento dorsali secundo basi macula utrinque, ventrali macula utrinque apice, segmentis tertio quintoque fascia apicali emarginata, pedibusque albidis; flagello segmentisque abdominalibus

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1—3 ferrugineis; alis hyalinis, apice infumatis; clypeo plano, apice late truncato, mesopleuris haud tuberculatis; segmento mediano area basali nitida, lateribus breviter oblique striata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; segmento abdominali primo solo ferrugineo; clypeo apice truncato, convexo; segmento mediano area basali lateribus punctata vel striata.

Long. ♀, 11-14 mm.; ♂, 9 mm.

♀. Middle lobe of the clypeus about half as broad again at the apex as long, flat, the apex broadly truncate and very slightly porrect. Antennæ inserted almost as near to the anterior ocellus as to the base of the clypeus, the second joint of the flagellum very slightly longer than the third. Eyes distinctly diverging towards the clypeus; posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment as long as broad; second ventral segment with a raised area at the base; fifth ventral segment widely emarginate at the apex, depressed at the base; pygidial area elongate ovate, narrowly truncate at the apex, twice as broad at the base as at the apex and about twice as long as the greatest breadth. Closely punctured, more deeply on the abdomen than on the thorax, median segment and mesopleuræ rugose; enclosed area at the base of the median segment smooth and shining, with short oblique striæ on the sides, the median groove transversely striated. First recurrent nervure received just before the middle of the second cubital cell.

♂. Clypeus longer than broad, truncate at the apex. Apical joint of the flagellum shorter than the penultimate, very slightly curved. Enclosed area at the base of the median segment smooth and shining, often with a few punctures or striæ at the sides; first abdominal segment much longer than broad; the raised area at the base of the second ventral segment distinct; pygidial area longer than broad, a little broader at the base than at the apex; first recurrent nervure received close to the base of the second cubital cell. Second ventral segment evenly punctured in both sexes.

Habitat.—W. India; Bombay to Quetta.

This is one of the few Indian species found at Quetta.

Cerceris wickwari sp. n.

♀. Nigra, clypeo, fronte, prothorace macula utrinque, segmento abdominalibus tertio quintoque fascia apicali, tegulis, tibiis tarsisque flavis; segmento abdominali primo rufo; clypeo subconcavo, apice truncato, segmento ventrali secundo area basali elevata, segmento mediano area basali punctata, in angulis striata.

Long. 9 mm.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♂. Feminæ similis; clypeo apice truncato, convexo.

♀. Clypeus concave on the apical half, broadly truncate at the apex. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, the second joint of the flagellum equal to the third. Cheeks a little more than half as broad as the eyes. Pronotum not depressed in the middle, rounded at the angles; mesopleuræ without spines. Basal abdominal, segment a little longer than broad, constricted at the apex. Second ventral segment with a raised area at the base; pygidial area elongate ovate, narrowly truncate at the apex. Strongly punctured, more closely on the head than elsewhere; the enclosed area at the base of the median segment punctured, obliquely striated in the angles and at the apex, with a deep median groove. First recurrent nervure received at one-fifth from the base of the 2nd cubital cell. Black; mandibles, except at the apex, clypeus, front, a spot on each side of the pronotum, tegulæ, a small spot at the anterior angles of the scutellum, a narrow apical band on the third dorsal abdominal segment, another on the fifth, the whole of the third ventral segment, a spot on each side of the fifth, tibiæ and tarsi yellow; first abdominal segment and second ventral segment ferruginous red, antennæ testaceous brown, the scape yellow beneath. Wings hyaline, with a very faint fuscous cloud at the apex, nervures testaceous.

♂. As in the female; but the clypeus is longer than broad, narrowly truncate at the apex; the pygidial area very small, coarsely punctured, truncate at the apex, twice as long as the greatest breadth, very slightly narrowed towards the apex.

Habitat.—Ceylon, Colombo (*Wickwar*). July to September, March to April.

In structure this resembles the last species (*allopicta*), but the second ventral segment is not evenly punctured, being almost smooth at the apex. The size and colour are also different.

Cerceris rybiensis Linn.

Sphex rybiensis Linn. Pand and Flora Rybijensis, p. 8, 1771.

Cerceris rybiensis Schlett. Zool. Jahrb. II, p. 375, 1887.

Cerceris kashmirensis Nurse Ann. and Mag. Nat. Hist. (7) XI., p. 524, 1903.

♀. Nigra; clypeo, fronte, pronoto utrinque, tegulis, postscutello, segmento abdominali secundo basi, tertio, quarto quintoque fascia apicali antice emarginata flavis, antennis ferrugineis vel nigris, pedibus testaceis flavo-variegatis; clypeo apice truncato, supra dimidium apicalem impresso; mesopleuris haud tuberculatis; segmento ventrali secundo area basali elevata; segmento mediano area basali in angulis striata; alis subhyalinis, nervulis fuscis vel testaceis.

♂. Feminæ similis; clypeo apice anguste truncato, latitudine longiore.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Long. ♀, 12 mm.; ♂, 9 mm.

♀. Clypeus broader than long, broadly truncate at the apex, a concave depression reaching from the apex to beyond the middle, the apical margin slightly recurved. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum very slightly longer than the third. Eyes slightly diverging towards the clypeus; posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment broader than long; second ventral segment with a raised area at the base; pygidial area elongate ovate, broader at the base than at the apex. Closely and rather coarsely punctured; the enclosed area at the base of the median segment opaque, striated in the corners and divided by a median groove. First recurrent nervure received at one-third from the base of the second cubital cell.

♂. Clypeus longer than broad, rather narrowly truncate at the apex. First abdominal segment longer than broad.

Habitat.—Kashmir 5—6,000 ft. (*Nurse*). May and June. Simla (*Nurse*). August and September.

The male from Simla has the apex of the clypeus black. *C. fortinata* Cam. is very near this species.

Cerceris fortinata Cam.

Cerceris fortinata Cam. Ann. and Mag. Nat. Hist. X., p. 57, 1902. ♂.

Cerceris unifasciata Bingh. ♀ (nec ♂, nec Smith), Fauna Brit. India. Hym. I., p. 310, 1897.

Cerceris aureobarba Cam. Ann. and Mag. Nat. Hist. (7) XV, p. 221, 1905. ♂.

♀. Nigra; clypeo et fronte flavis; pronoto utrinque, tegulis, postscutello, tibiis, tarsis, segmentis dorsalibus tertio quintoque fascia apicali ochraceis; clypeo apice truncato, dimidio apicali plano; segmento mediano area basali longitudinaliter striata; segmento ventrali secundo area basali elavata.

Long. 9—12 mm.

♂. Feminæ similis; clypeo convexo, apice truncato, margine apicali late nigro.

Long. 8—9 mm.

♀. Clypeus broader than long, broadly truncate at the apex, the apical half flattened, but not concave. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum only slightly longer than the third. Eyes parallel on the inner margin, posterior ocelli nearly twice as far from the eyes as from each other. Pronotum not impressed in the middle; mesopleuræ without tubercles: first abdominal segment longer than broad; second ventral

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

segment with a raised area at the base; pygidial area ovate, much broader at the base than at the apex, very narrowly truncate at the apex, granulate. Closely and deeply punctured, the enclosed area at the base of the median segment longitudinally striated, divided by a longitudinal groove. First recurrent nervure received at one-quarter from the base of the second cubital cell. Wings hyaline, strongly clouded with fuscous at the apex and in the radial cell.

♂. Clypeus longer than broad, convex and truncate at the apex. Apical joint of the flagellum not curved, shorter than the penultimate. First recurrent nervure received nearer to the base of the second cubital cell than in the female.

Habitat.—Northern India and Burma.

Bingham has taken his description of *unifasciata* from Smith's type, which came from North China and is not identical with the Indian species for which Cameron's name must stand. Bingham's short description of the female is apparently taken from an Indian specimen of the present species. The form of the clypeus in the male is quite different in the two species. I do not know that true *unifasciata* occurs in India. *C. aureobarba* Cam. is undoubtedly a synonym, and must sink, as is the case with most of the species of *Cerceris* described in the same paper.

Cerceris emarginata Panz.

Philanthus emarginatus Panz. Fann. Insect. German. VI, 1799.

Cerceris emarginata Spin. Insect. Ligur, I., p. 97, 1806.

♀. Nigra, clypeo, fronte, scapo, pronoto macula utrinque, tegulis, postscutello, segmento mediano macula parva utrinque, pedibus, segmento dorsali secundo basi, tertio, quarto, quintoque late flavis; alis hyalinis apice infuscatis; clypeo latitudine longiore, parte apicali depresso, apice truncato, segmento ventrali secundo area basali elevata; segmento mediano area basali basi longitudinaliter striata.

♂. Feminæ similis; segmento sexto flavo-fasciato, clypeo latitudine fere duplo longiore, apice truncato.

Long. ♀ 9 mm., ♂ 7 mm.

♀. Clypeus as long as broad, the apical half depressed, broadly truncate at the apex. Second joint of the flagellum longer than the third; mesopleuræ not tuberculate; first abdominal segment longer than broad, second ventral segment with a raised area at the base; pygidial area elongate ovate, nearly twice as broad at the base as at the apex. Strongly and closely punctured; the enclosed area at the base of the median segment longitudinally striated at the base, finely punctured at the apex, with a deep median groove.

The abdominal yellow fasciæ are not emarginate anteriorly.

Habitat.—Quetta (*Nurse*). May. Pishin (*Nurse*). April.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This common species is found throughout Central and Southern Europe and Turkestan.

Cerceris compta sp. n.

♀. Nigra; flagello subtus testaceo; segmento abdominali primo rufo-ferrugineo; clypeo, fronte, scapo, pronoto, tegulis, mesopleuris, scutello, postscutello, segmento mediano utrinque plus minus maculato, segmento dorsali secundo dimidio basali, tertio antice emarginato, quinto, ventralibus 2—5, pedibusque flavis; alis hyalinis, apice vix infumatis; clypeo basi modice convexo, dimidio apicali leviter impresso, apice late truncato; mesopleuris haud tuberculatis; segmento mediano area basali nitida, lateribus punctata; segmento ventrali secundo area basali elevata.

Long. 8 mm.

♀. Clypeus broadly truncate at the apex; a little convex at the base, the apical half slightly impressed. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum nearly half as long again as the third. Eyes parallel; posterior ocelli nearly as far from each other as from the eyes. First abdominal segment about as broad at the base as long, narrowed at the apex; second ventral segment with a raised area at the base; pygidial area ovate, narrower at the apex than at the base, rather more than half as long again as the greatest breadth. Closely but not coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with a median groove, sometimes with a few punctures on the sides. First recurrent nervure received at one-third from the base of the second cubital cell.

Habitat.—Karachi (*Comber*). October.

In colour this resembles *rufo-nodis* Rad., which has been given, whether rightly or not I do not know, as a synonym of *rubida* Jur. The scheme of colouring seems to be common to several species in Western Asia, and the present species is undoubtedly distinct from *rubida*.

Cerceris protea sp. n.

Cerceris protea Nurse m. s.

♂. Nigra; clypeo, fronte, scapo, genis, pronoto, tegulis, mesopleuries, scutello, postscutello, segmento mediano utrinque, segmento secundo basi, tertio macula nigra basali quarto quintoque fascia lata emarginata, pedibusque flavis; segmento primo, flagelloque ferrugineis; alis hyalinis, apice infuscatis; clypeo plano, apice late truncato; mesopleuris haud dentatis; segmento mediano area basali nitida, lateribus obscure striata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; genis nigris, flavomaculatis; clypeo latitudine longiore, apice truncato.

Long. ♀, 10 mm; ♂, 7-9 mm.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♀. Clypeus flat, as broad at the apex as long, the apical margin straight. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum no longer than the third. Eyes very slightly divergent towards the clypeus; posterior ocelli as far from the eyes as from each other. Mesopleuræ without tubercles; first abdominal segment slightly broader than long; second ventral segment with a raised area at the base; pygidial area narrow, elongate ovate, about three times as long as the greatest breadth, narrowly rounded at the apex. First recurrent nervure received at about one-quarter from the base of the second cubital cell. Closely and not very coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with short, obscure striæ on the sides, the median groove transversely striated.

♂. Clypeus truncate at the apex, longer than broad; apical joint of the flagellum shorter than the penultimate, not curved; first abdominal segment as in the female; pygidial area about half as long again as broad, the sides almost parallel.

Habitat.—Deesa and Abu (*Nurse*).

Cerceris novaræ Sauss.

?. *Cerceris pictiventris* Dahlb. Hymen. Europ. I., p. 498, 1845; Bingh. Fauna Brit. India Hym. I., p. 305, 1897.

Cerceris novaræ Sauss. Reise d. Novara Zool. II, p. 92, 1867. ♀; Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 257, 1890. ♂ ♀.

Cerceris fervens Sm. Ann. Mag. Nat. Hist. (4) XII, p. 411, 1873.

♀. Nigra; clypeo, fronte, scapo, pronoto macula utrinque, tegulis, postscutello, mesopleuris macula magna, segmento mediano macula magna utrinque, segmento secundo dorsali basi, tertio quintoque fascia apicali late emarginata, segmentis ventralibus 2-5, pedibusque flavis, clypeo plano, latitudine longiore, apice truncato, mesopleuris haud tuberculatis; segmento mediano area basali nitida, apice rugose striata; segmento ventrali secundo area basali elevata; alis hyalinis, apice infumatis.

♂. Feminæ similis; clypeo apice late rotundato; mesopleuris haud flavopictis; segmentis ventralibus 4-6 nigris.

Long. ♀, 9-11 mm.; ♂, 8-10 mm.

♀. Clypeus a little longer than broad, flattened in the middle and truncate at the apex. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum scarcely longer than the third. Eyes almost parallel, very slightly divergent towards the clypeus, posterior ocelli a little further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment longer than broad; second ventral segment with a raised area at the base; pygidial area elongate ovate, broader at the base than at the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

apex, twice as long as the greatest breadth. Coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with a broad, transversely striated median groove, and a few striations at the apex.

♂. Clypeus very broadly rounded at the apex, almost truncate, slightly convex. Antennæ inserted as near to the anterior ocellus as to the base of the clypeus, the apical joint no longer than the penultimate, not curved. Pygidial area about half as long again as broad.

Habitat.—The whole of India, Burma and Ceylon; but not extending beyond the eastern edge of the Rajputana desert in a North-westerly direction.

As I have not seen specimens of *pictiventris* from Java, I think it safer to use Saussure's name for this species, though it will very likely prove that it is identical with *pictiventris*. Specimens from Sarawak have the pygidial area of the female broader than in *novaræ*, and the abdomen in both sexes is a little broader in proportion; these will probably prove to be nearer the typical form.

Cerceris boysi sp. n.

♀. Nigra; clypeo, fronte, scapo, pronoto in medio interrupto, tegulis, macula pone oculos, mesopleuris macula, scutello, postscutello, segmento mediano macula apicali utrinque, segmentis dorsalibus 2-3, macula transversa magna utrinque, ventralibus 2-3 fascia lata, dorsalibus 4-5 fascia apicali, pedibusque eburneis; alis hyalinis, apice infumatis; stigmate testaceo; clypeo subquadrato, apice truncato, dentibus binis minutissimis armato; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata.

Long. 6 mm.

♀. Clypeus slightly convex, as long as broad, truncate at the apex, with a very minute tooth on each side. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum half as long again as the third. Eyes parallel, posterior ocelli half as far again from the eyes as from each other. Pronotum slightly depressed in the middle; mesopleuræ without tubercles; first abdominal segment subquadrate; second ventral segment with a raised area at the base; pygidial area ovate, broader at the base than at the apex, nearly twice as long as the greatest breadth and narrowly truncate at the apex. Punctured, coarsely, but not very closely on the abdomen, more finely on the head and thorax; the enclosed area at the base of the median segment smooth, with one or two large punctures and a deep median groove. First recurrent nervure received at one-sixth from the base of the second cubital cell.

Habitat.—India (*Boys*).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Type in Oxford University Museum ex coll. Westwood.

Captain Boys collected in the Almora and other North-Western hill districts.

Cerceris instabilis Sm.

Cerceris instabilis Sm. Cat. Hym. B. M. IV, p. 452, 1856. ♀.

Cerceris velox Sm. Trans. Ent. Soc. London, p. 41, 1875, ♂.

♀. Ferruginea; vertice mesothoraceque nigris; clypeo, fronte, scapo, vertice linea curvata, pronoto, scutello, postscutello, segmento mediano utrinque, segmento dorsali secundo basi, tertio quintoque totis flavis; alis hyalinis, apice valde infuscatis; clypeo apice emarginato angulis dentatis; mesopleuris haud tuberculatis; segmento ventrali secundo area basali minime elevata.

♂. Niger; maculis flavis ut in femina dispositis; segmento abdominali primo, secundo, tertioque apice ferrugineis; clypeo apice late rotundato, minutissime quadridentato.

Long. ♀, 9—11mm. ♂, 8—10 mm.

♀. Clypeus broader than long, rather widely emarginate at the apex, with a broad and slightly porrect tooth on each side at the angles of the emargination. Antennæ inserted less than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum scarcely longer than the third. Eyes parallel on the inner margins, posterior ocelli half as far again from the eyes as from each other. First abdominal segment distinctly longer than broad; second ventral segment with the raised area at the base not very distinct; pygidial area rugose, narrowed from the base, about half as broad again at the base as at the apex. Closely, but not deeply, punctured; the enclosed area at the base of the median segment longitudinally striated.

♂. Clypeus nearly as broad as long, very broadly rounded at the apex and armed with four minute teeth. First abdominal segment nearly twice as long as broad; the area at the base of the second ventral segment more strongly raised than in the female. More deeply punctured than in the female, the enclosed area at the base of the median segment punctured and more or less longitudinally striated. Pygidial area a little longer than broad, the sides almost parallel.

Habitat.—Burma, Ceylon, and the whole of India, except the extreme North-west.

Apparently not as common in the hills as on the plains, but I have taken it at 6,000 ft. in the Khasi Hills. The colour is very variable.

Cerceris bifasciata Guér.

Cerceris bifasciata Guér. Cuv. Iconog. Regn. Anim. Insectes, p. 443, 1829-1844, Pl. 71, fig. 9.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I cannot identify the species: the figure is a tolerable representation of *C. fortinata* Cam., but does not agree with the description, which seems to point to a variety of *C. instabilis* Sm. "Entièrement fauve, ponctué, avec le devant de la tete, au-dessous de l'insertion des antennes, le premier article de celles-ci, la base des mandibules et les troisieme et cinquieme anneaux de l'abdomen jaunes. Ailes un peu teintees de jaunatre avec une petite tache brune au bout.

L. 5 mil. *Hab.* le Bengale."

The length given on the plate is 10 mm.

On the whole I think there can be little doubt that the name should apply to *C. instabilis* Sm., over which it has priority.

Cerceris abuensis sp. n.

♀. Nigra; mandibulis basi, clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento dorsali secundo basi, tertio fascia apicali late emarginata, quinto macula apicali, segmento ventrali tertio utrinque, tibiis tarsisque albidis; segmento abdominali primo, segmento ventrali secundo, femoribusque ferrugineis; flagello subtus fusco-ferrugineo; clypeo subconvexo, margine apicali late truncato, dentibus duobus medianis armato; mesopleuris haud tuberculatis; segmento mediano area basali oblique striata; segmento ventrali secundo area basali elevata; alis hyalinis, apice infumatis.

♂. Feminæ similis; segmento dorsali quinto immaculato, segmento sexto fascia late flavida; clypeo latitudine longiore, apice subtruncato; segmento ventrali secundo area basali minime elevata; segmento ventrali sexto utrinque dente armato.

Long. ♀, 8 mm.; ♂, 9 mm.

♀. Clypeus much broader than long, coarsely punctured, broadly truncate at the apex, with a narrow and shallow incision in the middle of the apical margin, the angles of the incision produced into short, blunt teeth. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum about half as long again as the third. Eyes parallel; posterior ocelli a little further from the eyes than from each other. Pronotum not depressed in the middle; mesopleuræ without tubercles; first abdominal segment as long as broad, narrowed at the apex; second ventral segment with a rather feebly raised basal area; pygidial area small, twice as broad at the base as at the apex, gradually narrowed, less than twice as long as the breadth at the base. Closely and deeply, but not very coarsely punctured; the enclosed area at the base of the median segment coarsely obliquely striated on the basal half, indistinctly striated at the apex, the median groove indistinct.

♂. Clypeus longer than broad convex; the apical margin almost

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

transverse, narrowly depressed, with four raised carinæ on the depressed margin simulating teeth. Apical joint of the flagellum shorter than the penultimate, slightly curved. First abdominal segment about twice as long as broad; the raised area at the base of the second ventral segment not clearly defined. Sixth ventral segment with a short acute spine on each side at the apical angles. Pygidial area coarsely punctured, narrowed at the base, truncate at the apex, half as long again as the greatest breadth. The striæ on the enclosed area at the base of the median segment are longitudinal and very coarse.

Habitat.—Mount Abu (*Nurse*).

In colour this resembles *C. albopicta* Sm.

Cerceris belli sp. n.

♀. Nigra; segmento primo abdominali rufo-ferrugineo; flagello subtus testaceo; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento secundo dorsali macula basali et apice late utrinque, segmento tertio fascia late interrupta, quarto macula utrinque, quinto fascia late emarginata pedibusque flavis; alis hyalinis, apice infuscatis; clypeo apice porrecto, late angulariter inciso; mesopleuris haud tuberculatis; segmento mediano area basali nitida, sparse punctata; segmento ventrali secundo area basali minime elevata.

Long. 7 mm.

♀. Clypeus convex, porrect at the apex, the margin widely triangularly incised, the angles of the incision slightly produced and almost forming teeth. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum less than half as long again as the third. Eyes almost parallel; posterior ocelli a little further from the eyes than from each other. Pronotum, not depressed in the middle, rounded at the angles; mesopleuræ without tubercles. First abdominal segment a little broader than long; second ventral segment with a very indistinct raised area at the base. Pygidial area closely punctured, nearly twice as long as broad, truncate at the apex, the sides parallel. Closely and rather coarsely punctured; the enclosed area at the base of the median segment shining, with a few large punctures. First recurrent nervure received just beyond one-quarter from the base of the second cubital cell.

Habitat.—Belgaum, W. India (*Bell*). July.

Cerceris pulchra Cam.

Cerceris pulchra Cam, Mem. Manch. Lit. and Phil. Soc. (4) III, p. 253, 1890. ♀ ♂.

♀. Nigra; flagello, segmentisque abdominalibus primo secundoque ferrugineis; clypeo, fronte, pronoto utrinque, tegulis, postscutello, segmento dorsali secundo macula basali, tertio basi nigro maculato, quinto, pedibusque

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

flavis; alis hyalinis, apice infuscatis; clypeo lamina subporrecta, apicali, emarginata, sub lamina angulariter inciso; mesopleuris haud tuberculatis; segmento mediano area basali punctata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; segmento dorsali secundo nigro; clypeo apice rotundato; pilis flavis ciliato.

Long. ♂ ♀, 7 mm.

♀. Clypeus flattened, the lamina slightly porrect at the apex, shallowly and very widely emarginate, the apical margin below the lamina deeply incised. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus; the second and third joints of the flagellum of equal length. Eyes parallel; posterior ocelli further from the eyes than from each other. First abdominal segment longer than broad, second ventral segment with a raised area at the base; pygidial area narrow, two-and-a-half times as long as the greatest breadth, slightly narrowed to the apex. Closely and rather deeply punctured, most coarsely on the thorax; the enclosed space at the base of the median segment punctured.

♂. Clypeus rounded at the apex and fringed with yellow hairs; first abdominal segment a little longer than in the female, more than half as long again as broad, pygidial area small, a little longer than broad.

Habitat.—Bengal; Barrackpore, Nuddea (*Rothney*).

I doubt if Bingham's records of this species from Western and North-Western India are correct.

Cerceris opulenta sp. n.

♀. Nigra; mandibulis basi, clypeo, fronte, scapo, pronoto, tegulis scutello, postscutello, segmento abdominali secundo dimidio basali, tertio quintoque totis, pedibusque flavis; segmento primo rufo-ferrugineo; flagello fusco-ferrugineo; alis hyalinis, apica infuscatis, venis fuscis; clypeo lato, apice leviter porrecto, subemarginato; mesopleuris haud tuberculatis; segmento mediano area basali subnitida, in angulis striata; segmento ventrali secundo area basali elevata.

Long. 8 mm.

♀. Clypeus twice as broad at the apex as long, the apical margin widely and shallowly emarginate and slightly porrect. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus; the second and third joints of the flagellum almost equal in length. Eyes parallel, the posterior ocelli almost as far from each other as from the eyes. Pronotum not depressed in the middle; mesopleuræ without tubercles. First abdominal segment distinctly longer than broad; second ventral segment with a raised area at the base. Pygidial area gradually narrowed from the base, punctured, narrowly truncate at the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

apex, more than three times as broad at the base as at the apex, about half as long again as the greatest breadth. Closely but not very coarsely punctured; the enclosed area at the base of the median segment smooth, obliquely striated in the corners, with very short striæ on the sides and a deep median groove. First recurrent nervure received just before one-third from the base of the second cubital cell.

Habitat.—Shadipali, Sindh (*Comber*).

In addition to colour differences this species may be distinguished from *C. tristis* Cam. by the much broader pygidial area, and from *C. pulchra* Cam. by the shallower and less angular emargination of the clypeus.

Cerceris tristis Cam.

Cerceris tristis Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 255, 1890. ♀ ♂.

♀. Nigra; segmentis abdominalibus primo secundoque ferrugineis; flagello subtus testaceo; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento dorsali secundo macula basali, tertio macula basali nigra, quinto, tibiis tarsisque pallide flavis; alis hyalinis, apice leviter infuscatis, venis fuscis; clypeo subconvexo, apice late emarginato; mesopleuris haud tuberculatis; segmento mediano area basali nitida, sparse punctata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; clypeo apice anguste truncato; segmento quinto secundoque apice nigris; sexto flavo.

Long. ♀, 7 mm.; ♂, 6 mm.

♀. Clypeus much broader than long, widely and rather shallowly emarginate. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum very slightly longer than the third. Eyes parallel; posterior ocelli further from the eyes than from each other. Pronotum not depressed in the middle, rounded at the anterior angles; mesopleuræ without tubercles. First abdominal segment a little longer than broad; second ventral segment with a raised area at the base; pygidial area elongate ovate, a little more than twice as long as the greatest breadth. Closely, but not coarsely punctured; the enclosed area at the base of the median segment shining, with a few large punctures, the median groove deep. First recurrent nervure received just before one-third from the base of the second cubital cell. Wings iridescent.

♂. Clypeus as long as broad, narrowed towards the apex, the margin rather narrowly truncate. Apical joint of the flagellum shorter than the penultimate, scarcely curved. First abdominal segment much longer than broad.

Habitat.—Quetta (*Nurse*). July. Deesa (*Nurse*). April. Ceylon (*Wickwar*). Barrackpore (Rothney).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Very near *rubida* Jur., but is much less coarsely punctured. It may be distinguished from *pulchra* Cam. by the less distinct raised area on the second ventral segment, and by the truncate apex of the clypeus of the male. Bingham's record of *pulchra* from N. W. Provinces may perhaps apply to this species. The typical form of *tristis* is without the ferruginous colour on the two basal abdominal segments, but the variety I have described here is the usual form. It seems to be one of the commonest Indian species, and has been confused in Rothney's collection with *C. pulchra*, which has the incision of the clypeus more angular, and is a somewhat larger species.

Cerceris melaina sp. n.

♀. Nigra ; clypeo fascia, scapo macula, pronoto macula utrinque, segmento abdominali secundo macula parva basali, tertio fascia apicali pallide flavis; segmento primo rufo; pedibus flavovariegatis; clypeo lato, apice lamina libera truncata, segmento mediano area basali rugose striata, segmento ventrali secundo area basali elevata.

Long. 8 mm.

Clypeus slightly porrect, sparsely punctured, nearly twice as broad at the apex as long, the lamina free at the apex and broadly truncate. Inner margins of the eyes parallel, the breadth of the cheeks equal to rather more than half of the greatest breadth of the eyes. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second and third joints of the flagellum of about equal length, the interantennal carina short, conical between the antennæ and continued much lowered to the base of the clypeus. Ocelli in a very broad triangle, the posterior pair less than half as far again from the eyes as from each other. The whole insect closely and rather deeply punctured; the triangular area at the base of the median segment coarsely obliquely rugose striate. Pronotum short, not depressed in the middle; mesopleuræ without spines. First abdominal segment broader in the middle than long, constricted at the apex; second ventral segment with a raised area at the base. Fifth ventral segment normal; pygidial area pyriform, twice as long as the greatest breadth, much narrowed from the middle posteriorly and very narrowly truncate at the apex. First recurrent nervure received at one-third from the base of the second cubital cell.

Black; a triangular spot on the inner margin of the eyes, a transverse band on the middle of the clypeus, the scape beneath, a small spot on each side of the pronotum, a spot on the tegulæ, a small spot at the base of the second dorsal segment of the abdomen, a narrow band at the apex of the third, a small spot at the apex of the fifth, and a large spot on each side of the third ventral segment pale yellow; the legs black,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

irregularly variegated with yellow and ferruginous; first abdominal segment and second ventral segment ferruginous red. Wings hyaline, with a small fuscous cloud at the apex, nervures fuscous.

Habitat.—Nasik, W. India. (*Comber*).

This is very near *C. vischnu* Cam., the shape of the pygidial area and the sculpture being very similar, but the clypeus is truncate, not incised, and the petiole is feruginous. The latter distinction is of little importance, but I consider the shape of the clypeus quite sufficient for specific distinction.

Cerceris vischnu Cam.

Cerceris vischnu Cam. Mem. Manchester Lit. Phil. Soc. (4) III., p. 254, 1890. ♀ ♂.

Cerceris dolosa Nurse Ann. and Mag. Nat. History (7) XI., p. 525, 1903.

♀. Nigra; Mandibulis basi, clypeo in medio, margine interiore oculorum late, scapo subtus, segmentis tertio quintoque fascia angusta apicali, segmento ventrali tertio fere toto, tibiis subtus tarsisque pallide flavis, flagello subtus, coxis, trochanteribus, femoribus, segmentoque ventrali secundo ferrugineis, alis hyalinis, apice leviter infumatis, clypeo lamina apicali libera, apice incisa; segmento mediano area basali longitudinaliter striata; segmento ventrali secundo area basali elevata.

♂. Feminæ similis; clypeo apice rotundato, haud inciso.

Long. ♀ 8 mm., ♂ 7 mm.

♀. Clypeus as long as broad, the lamina free at the apex and shallowly incised. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum less than half as long again as the third. Posterior ocelli almost as far from each other as from the eyes, the inner margins of the eyes parallel. Mesopleuræ without tubercles; first abdominal segment nearly as long as broad; second ventral segment with a raised area at the base; pygidial area narrow, broadest at the base, gradually narrowed to the apical margin, which is very narrowly truncate, fully twice as long as the greatest breadth. Coarsely and closely punctured, the enclosed area at the base of the median segment coarsely longitudinally striated. First recurrent nervure received close to the middle of the second cubital cell.

♂. The clypeus is without the free lamina at the apex broadly rounded on the apical margin, with two minute teeth in the middle; first abdominal segment much longer than broad; pygidial area nearly square.

Habitat.—Abu (*Nurse*). Kangra Valley, 4,500 ft. (*Dudgeon*). Oddichudan, N. Ceylon (*Wickwar*).

The type is not marked in Rothney's collection and I doubt if Bingham's description is taken from a female of this species. There is no mention of ferruginous on the basal and second abdominal segments in Cameron's description, which agrees well with *dolosa*. The male referred by Cameron

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to this species, and marked *fervens* by Smith in Rothney's collection, is undoubtedly *dolosa*, and I have no doubt that Cameron's description of the female is correct, and Bingham's erroneous.

Cerceris funerea Costa var. *pallidopicta* Rad.

Cerceris pallidopicta Rad. Fedtsch. Turkestan Sphegid, p. 59, 1877. ♀.

Cerceris funerea var *pallidopicta* Ed. Andrè Spec. Hym. Eur. III., p. 272, 1889.

♀. Nigra; mandibulis, clypeo, fronte, pronoto, tegulis, postscutello, segmento dorsali secundo macula apicali nigra, tertio macula basali nigra, quinto macula parva utrinque, pedibusque pallide flavis; flagello, femoribus segmentisque ventralibus primo secundoque testaceis; clypeo dimidio apicali depresso, apice late truncata; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata; segmento ventrali quinto late emarginata, angulis apicalibus dentato.

Long. 12 mm.

♀. Middle lobe of the clypeus a little longer than broad, the apical half flattened, broadly truncate at the apex. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, second joint of the flagellum nearly half as long again as the third; the frontal carina short and low, separated by its own length from the base of the clypeus. Eyes slightly diverging towards the clypeus; posterior ocelli nearly as far from each other as from the eyes. First abdominal segment almost quadrate; pygidial area elongate ovate, twice as long as the greatest breadth, narrower at the apex than at the base. Closely and rather coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with a median groove. Wings hyaline, with a very faint fuscous cloud at the apex.

Habitat.—Quetta (*Nurse*). June.

A single female in Colonel Nurse's collection corresponds well with the brief description and excellent figure given by Radoszkowski. The species is easily distinguished by the stout spines at the apical angles of the fifth ventral segment. The typical form of *funerea* is from S. E. Europe.

Two Fabrician species, which I have been unable to identify, doubtless belong to *Cerceris*, and are probably identical with subsequently described species; but I have not been able to consult the types, which are at Copenhagen. These are:

1. *Philanthus interstinctus* Fabr.

Philanthus interstinctus Fabr. Ent. Syst. Suppl., p. 269, 1798.

2. *Philanthus dissectus* Fabr.

Philanthus dissectus Fabr. Ent. Syst. Suppl., p. 269, 1798.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON SOME ASIATIC SPECIES NOT OCCURRING WITHIN THE BOUNDARIES OF INDIA.

Cerceris pedetes Kohl.

Cerceris pedetes Kohl. Zool. Jahrb. II, p. 449, 1887. ♀.

Cerceris bicornuta Sm. Cat. Hym. B. M. IV, p. 455, 1856. ♀. (nec. Guérin).

Cerceris smithii D. T. Wien entom. Zeitg. IX, p. 199, 1890.

C. bicornuta Sm. is the eastern representative of *C. ferreri*, and I think is undoubtedly identical with *C. pedetes*.

Habitat.—N. China (*Smith*); Korea (Kohl).

Cerceris lama sp. n.

♀. Nigra; capite longe nigro hirsuto; clypei lamina, margine interiore oculorum late, macula parva pone oculos, pronoto, tegulis, postscutello, segmentisque dorsalibus 1—5 fascia late apicali emarginata lacteis; alis subhyalinis, margine costali infumato, venis nigris; clypeo lamina libera, porrecta, apice truncata; mesopleuris bituberculatis: segmento mediano area basali nitida; abdomine nitido impunctato; segmento ventrali secundo area basali elevata nulla.

Long. 14 mm.

♀. Mandibles with a strong tooth on the inner margin nearer to the base than to the apex. Clypeus rather short with a prominent lamina from the base, the lamina longer than broad, slightly arched, and truncate at the apex; the apical margin of the clypeus below the lamina deeply semicircularly emarginate. Antennæ inserted low down, almost touching the base of the clypeus; the second joint of the flagellum as long as the first and third combined, the carina between the antennæ rather low. Posterior ocelli nearly twice as far from the eyes as from each other; the eyes diverging towards the clypeus; cheeks very broad, nearly half as broad again as the eyes. Mesopleuræ bituberculate, the posterior tubercle, the largest; first abdominal segment nearly twice as broad as long; the segments scarcely constricted, second ventral segment without a raised area at the base; pygidial area with parallel sides, subtruncate at the apex and about two and a half times as long as broad, the surface rugulose at the base. Head and thorax sparsely punctured; closely punctured rugulose on the front; mesopleuræ and median segment closely punctured; the enclosed area at the base of the median segment smooth and shining, with the usual median groove; abdomen smooth and shining. First recurrent nervure received at about one-quarter from the base of the second cubital cell; second close to the base of the third cubital cell.

Habitat.—Gyangtse, Tibet, 13,000 ft., June 1904 (*H. J. Walton*).

Described from twelve specimens in the British Museum.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The colour of the markings is of the lacteous white characteristic of the district.

Cerceris ariadne sp. n.

♀. Nigra; mandibulis basi, femoribus apice, tibiis tarsisque rufo-testaceo; clypeo linea transversa, margine anteriore oculorum anguste, tegulis postscutello, segmentis dorsalibus 1-4 fascia transversa apicali flavis; alis hyalinis, apice leviter infuscatis, venis fuscis; clypeo lamina libera, porrecta, apice late emarginata, mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla.

Long. 10 mm.

♀. Clypeus with the lamina porrect from the base, broader than long, widely and shallowly emarginate at the apex, the clypeus below the lamina concave, shining and truncate at the apex. Antennæ inserted low down, close to the base of the clypeus; second joint of the flagellum about half as long again as the third. Eyes almost parallel; posterior ocelli about one-quarter further from the eyes than from each other. Pronotum not depressed in the middle, mesopleuræ not tuberculate. First abdominal segment much broader than long; second ventral segment without a raised area at the base; pygidial area nearly three times as long as the greatest breadth, the sides nearly parallel from the base to beyond the middle, then rather sharply narrowed and very narrowly rounded at the apex. Shining, rather sparsely and not very deeply punctured; the enclosed space at the base of the median segment smooth and shining, with a median groove. Pubescence on the head and sides of the thorax rather long and greyish. The apical yellow bands on segments one and four are narrowly interrupted in the middle. Wings hyaline, clouded with pale fuscous on the costa; first recurrent nervure received at one-third from the base of the second cubital cell.

Habitat.—Gyangtse, Tibet, 13,000 ft. (*H. J. Walton*); June.

Allied to *C. interrupta* Panz., but in the present species the lamina of the clypeus is free at the base and the enclosed area of the median segment is smooth.

Cerceris shelfordi sp. n.

♀. Nigra; mandibulis basi, clypeo, margine interiore oculorum latissime, carina frontali, scapo subtus, macula pone oculos, vertice maculis duabus obliquis, pronoto macula utrinque, tegulis, mesopleuris macula scutello fascia transversa, postscutello, segmento mediano fascia lata curvata utrinque, segmento dorsali primo apice, secundo fascia angusta apicali maculisque duabus basalibus, segmentis 3-5 fascia angusta apicali, 2-5 lateribus late et ventralibus utrinque flavis, oculis divergentibus; clypeo,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

apice lamina libera, obtuse bidentata; mesopleuris spina magna armatis; segmento mediano area basali oblique striata; segmento ventrali secundo area basali elevata nulla; pedibus flavis.

Long. 10 mm.

♀. Head very large and broad; middle lobe of the clypeus short broader than long, the lamina free at the apex and truncate, armed with two blunt teeth; lateral lobes of the clypeus very broad, with a small tooth close to the inner margin. Antennæ inserted a little further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum a little less than half as long again as the third. Eyes strongly diverging towards the clypeus; posterior ocelli nearly twice as far from the eyes as from each other; the cheeks a little broader than the greatest breadth of the eyes. Pronotum not depressed in the middle; mesopleuræ swollen and armed with a long, acute spine. First abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base; the segments not strongly constricted; fifth ventral segment widely emarginate at the apex; pygidial area about twice as broad at the base as at the apex, gradually narrowed, twice as long as the greatest breadth. Head and thorax closely but not deeply punctured; the enclosed area at the base of the median segment coarsely obliquely striated, mesopleuræ very coarsely striated; abdomen subopaque, microscopically punctured. Wings subhyaline, the apex and the radial cell fuscous; nervures fuscous; first recurrent nervure received beyond one-third from the base of the second cubital cell.

Habitat.—Kuching, N. W. Borneo (*Shelford*); October.

Type in Oxford University Museum.

Nearly allied to *C. ferox* Sm., but differs in the form of the clypeus, the greater development of the spine on the mesopleuræ and the much shorter petiole.

Cerceris ferox Sm.

Cerceris ferox Sm. Cat. Hym. B. M. IV, p. 454, 1856. ♀. Bingh. Fascic Malay. Zool. I, App. p. v, 1903 ♀.

Cerceris annandalei Bingh. Fascic. Malay. Zool. I, App. p. v., 1903. ♂.

Habitat.—Sumatra; Biserat, Siamese Malaya.

I am not aware that this species occurs within the boundaries of British India; the specimen from Tenasserim in the British Museum marked by Bingham as a variety of *ferox* is quite distinct.

The species closely allied to *C. ferox* may be recognized by the following key

1. Clypeus with the lamina broadly rounded at the apex and slightly porrect; petiole longer than broad .. .. *C. ferox* Sm.
   Sumatra and Selangor.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Clypeus with the lamina incised or bidentate at the apex ; petiole broader than long ..	2
2.	Lamina of clypeus porrect at apex and incised	*C. ferocior* Turn. Sarawak.
	Lamina of clypeus not porrect, truncate, with two strong median teeth	*C. shelfordi* Turn. Sarawak.

Cerceris ferocior, sp. n.

♀. C. shelfordio colore affinissima ; clypeo lamina apicali libera, porrecta, apice emarginata ; mesopleuris tuberculatis, spina minuta armatis; segmento mediano area cordata basi oblique, apice transverse striata ; segmento abdominali primo latitudine fere aequilongo.

Long. 13 mm.

♀. Head very broad, twice as broad as the thorax ; clypeus with the lamina free from a little before the apex, porrect and deeply and widely incised at the apex. Outer lobes of the clypeus very broad, with a tooth at the inner apical angle. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus ; the second joint of the flagellum nearly half as long again as the third. Eyes diverging strongly towards the clypeus ; the posterior ocelli more than twice as far from the eyes as from each other. Cheeks as broad as the greatest width of the eyes. Mesopleuræ swollen, with a minute spine. First abdominal segment nearly as long as broad, second ventral segment without a raised area at the base ; pygidial area about half as broad at the apex as at the base, gradually narrowed, a little more than twice as long as the greatest breadth. Head closely but not coarsely punctured, the front between the ocelli and the base of the antennæ longitudinally striate-rugulose ; thorax very sparsely punctured, the anterior half of the mesonotum longitudinally striated, mesopleuræ and median segment more deeply and closely punctured ; the enclosed area at the base of the median segment obliquely striated at the base, transversely at the apex, the median groove indistinct. Petiole sparsely punctured ; the remainder of the abdomen smooth ; the segments not strongly constricted.

The yellow bands on the vertex are longitudinal, not oblique, the spot behind the eye is large and curved and the band on the scutellum is interrupted. Wings hyaline, broadly fuscous on the costal margin.

Habitat.—Kuching, N. W. Borneo (*Shelford*). September. Type in Oxford University Museum.

This is nearer to *ferox* than *shelfordi*, but may be distinguished by the shape of the lamina of the clypeus, which is broadly rounded at the apex

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in *ferox* but deeply incised in *ferocior*. The petiole is also much longer in *ferox*, and the striation of the cordate area of the median segment is longitudinal. The markings in the three species are almost identical.

Cerceris invita sp. n.

♀. Nigra, opaca; clypeo, mandibulis basi, margine interiore oculorum, carina frontali, pronoto utrinque, tegulis, postscutello, segmentoque abdominali secundo basi anguste flavis; scapo, flagello subtus, segmento abdominali primo, pedibusque testaceis; alis hyalinis, apice infumatis, venis testaceis; clypeo apice emarginato, angulis dentato; mesopleuris minute bituberculatis; segmento mediano area basali delicatissime oblique striata, segmento ventrali secundo area basali elevata nulla.

Long. 13 mm.

♀. Clypeus flat, short, rather widely emarginate at the apex, the angles of the emargination produced into broad and slightly porrect teeth. Antennæ inserted nearly twice as far from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum half as long again as the third; the frontal carina produced into a small tubercle at the apex. Eyes diverging towards the clypeus; posterior ocelli twice as far from the eyes as from each other. Pronotum not depressed in the middle; mesopleuræ with two minute tubercles. First abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base; pygidial area finely transversely rugulose, about two and a half times as long as the breadth at the base, gradually narrowed from the base and almost pointed at the apex. Opaque, pubescent, shallowly punctured; the enclosed area at the base of the median segment finely striated, obliquely in the angles, more indistinctly in the middle, intermixed with fine punctures, with a low median carina instead of the usual groove. First recurrent nervure received just before the middle of the second cubital cell.

Habitat.—Sumatra. Type in Oxford University Museum, ex coll. Westwood.

The clypeus resembles that of *C. instabilis* Sm.

Cerceris excavata Cam.

Cerceris excavata Cam. Journ. Straits Asiatic Soc., p. 135, 1902. ♂.

This is the representative of *C. vischnu* Cam. in Borneo.

The male only differs from *vischnu* in having the petiole a little shorter and broader, and in the much less distinctly raised basal area of the second ventral segment. The female has no raised area at the base of the second ventral segment, there is a yellow spot at the base of the second dorsal segment and the wings are strongly shaded with fuscous on the costal margin.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

49

50

51

52

53

54

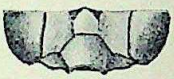
55

56

57

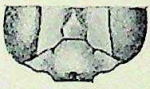
58

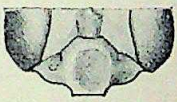
59


60

61

62

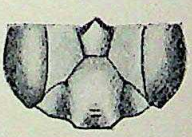

63


64

65

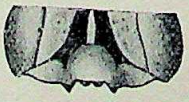
66

67


68

69

70


71

72

Catherine A. M. Pearce.

INDIAN FOSSORIAL WASPS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MONOGRAPH OF THE WASPS OF BRITISH INDIA.

EXPLANATION OF PLATE C.

49.	*Cerceris fortinata*, Cam. ♀.	Front of head.
50.	*Cerceris compta*, Turn. ♀.	" "
51.	*Cerceris instabilis*, Sm. ♀.	" "
52.	*Cerceris elizabethæ*, Bingh. ♀.	" "
53.	*Cerceris mastogaster*, Sm. ♀.	" "
54.	*Cerceris vischnu*, Cam. ♀.	" "
55.	*Cerceris ferox*, Sm. ♀.	" "
56.	*Cerceris violaceipennis*, Cam. ♀.	" "
57.	*Cerceris comberi*, Turn. ♀.	" "
58.	*Cerceris fastidiosa*, Turn. ♀.	" "
59.	*Cerceris melaina*, Turn. ♀.	" "
60.	*Cerceris tristis*, Cam. ♀.	" "
61.	*Cerceris ferocior*, Turn. ♀.	" "
62.	*Cerceris circumcincta*, Turn. ♀.	" "
63.	*Cerceris nursei*, Turn. ♀.	" "
64.	" " " ♂.	" "
65.	*Cerceris invita*, Turn. ♀.	" "
66.	*Cerceris novaræ*, Sauss. ♀.	" "
67.	*Cerceris rhyncophora*, Turn. ♀.	" "
68.	*Cerceris hilaris*, Sm. ♂.	" "
69.	*Cerceris baluchistanensis*, Cam. ♀.	" "
70.	*Cerceris boysi*, Turn. ♀.	" "
71.	*Cerceris shelfordi*, Turn. ♀.	" "
72.	*Cerceris inexorabilis*, Turn. ♀.	Side of head.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

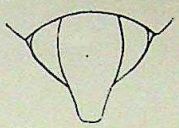
MONOGRAPH OF THE WASPS OF BRITISH INDIA.

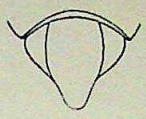
EXPLANATION OF PLATE D.

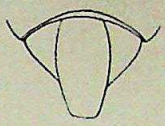
73.	*Cerceris fortinata*, Cam. ♀.	Pygidial area.
74.	*Cerceris compta*, Turn. ♀.	" "
75.	*Cerceris instabilis*, Sm. ♀.	" "
76.	*Cerceris elizabethæ*, Bingh. ♀.	" "
77.	*Cerceris mastogaster*, Sm. ♀.	" "
78.	*Cerceris vischnu*, Cam. ♀.	" "
79.	*Cerceris ferox*, Sm. ♀.	" "
80.	*Cerceris violaceipennis*, Cam. ♀.	" "
81.	*Cerceris comberi*, Turn. ♀.	" "
82.	*Cerceris fastidiosa*, Turn. ♀.	" "
83.	*Cerceris melaina*, Turn. ♀.	" "
84.	*Cerceris tristis*, Cam ♀.	" "
85.	*Cerceris ferocior*, Turn. ♀.	" "
86.	*Cerceris circumcincta*, Turn. ♀.	" "
87.	*Cerceris nursei*, Turn. ♀.	" "
88.	" " " ♂.	" "
89.	*Cerceris invita*, Turn. ♀.	" "
90.	*Cerceris novaræ*, Sauss. ♀.	" "
91.	*Cerceris rhyncophora*, Turn. ♀.	" "
92.	*Cerceris hilaris*, Sm. ♂.	" "
93	*Cerceris baluchistanensis*, Cam. ♀.	" "
94.	*Cerceris boysi*, Turn. ♀.	" "
95.	*Cerceris shelfordi*, Turn. ♀.	" "
96.	*Cerceris mastogaster*, Sm. ♀.	Ventral surface of abdomen.

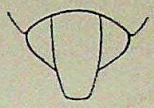
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

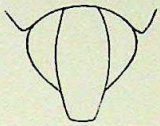
Digitized by Arya Samaj Foundation Chennai and eGangotri

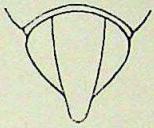

73

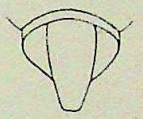

74

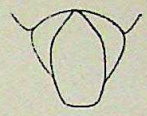

75

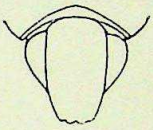

76

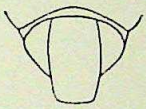

77

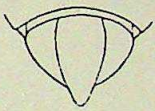

78

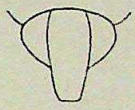

79

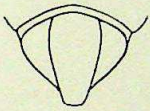

80

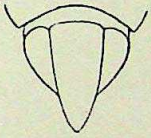

81

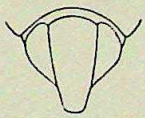

82

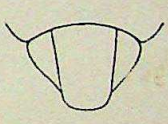

83

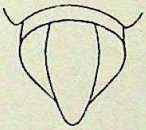

84

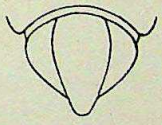

85

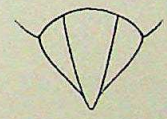

86

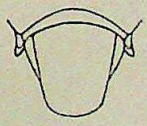

87

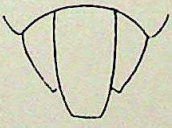

88


89

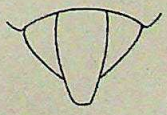

90


91


92


93

94


95

96

Catherine A. M. Pearce.

INDIAN FOSSORIAL WASPS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Cerceris maculata Rad.

Cerceris maculata Rad. Fedtsch: Reise Turkestan, p. 57, Pl. viii, fig. 2, 1877. ♀.

♀. Central lobe of the clypeus more than half as broad again as long, convex, truncate at the apex, with two small spines near the middle of the apical margin. Second joint of the flagellum distinctly longer than the third. Front broad, the eyes diverging slightly towards the clypeus, the cheeks less than half as broad as the eyes. Pronotum very slightly depressed in the middle, rounded at the angles; mesopleuræ without spines. First abdominal segment broadest in the middle, a little broader than long; second ventral segment without a raised area at the base; pygidial area elongate pyriform, very narrowly truncate at the apex. Coarsely punctured; the triangular area at the base of the median segment shining, coarsely longitudinally striated at the base, the median groove transversely striated, the sides very delicately punctured. First recurrent nervure received before one-third from the base of the second cubital cell.

Habitat.—Basuft, S. W. Persia (*Escalera*).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA.

REPORT BY R. C. WROUGHTON, F.Z.S.

COLLECTION	No. 2.
LOCALITY	Berars.
DATE	May-June, 1911.
COLLECTED BY	Mr. C. A. Crump.
EARLIER REPORT	No. 1, E. Khandesh, Vol. XXI, p. 392 (1912).

This collection was made in the northern part of the Berars, commonly known as the Melghat. The country is hilly, and, for the most part, well wooded, the forest being composed of teak mixed with bamboos, and with sundry other trees commonly found associated with it, many of which are evergreen. The subsoil is the Dekhan trap rock, and the crops raised are for the most part those used for local consumption, such as 'nagli' and 'bajri.' The climate too is very much the same as that of the Dekhan. Some of the specimens were taken at Ellichpur and represent the Fauna of the broad valley known as the Payanghat, forming the large bulk of the Berars. Here we find great alluvial black soil plains producing cotton and jowari, whose only tree growth is patches of babhul.

The collection is a small one, comprising 69 specimens belonging to 22 species in 17 genera.

For the most part the species are the same as those contained in the Khandesh collection. Most of those that have been added to the earlier list represent the Fauna of a more jungly country, *e.g.*, the Flying Squirrel, the Wild Dog, the Palm Squirrel, the Barking Deer, and the Four-horned Antelope.

PRESBYTIS ENTELLUS, Dufr.

The common Langur.

(For synonymy, see Report No. 1.)

♂ 164. Chikalda, Berars.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♀ 187, 192. Sembadoh, Berars.

(*Vide* also Report No. 1.)

These specimens appear quite like those from Khandesh.

Note.—In the notice of *Presbytis entellus* in Report No. 1 by inadvertence the name *leucopus* has been used, it should have been *hypoleucos*.

PTEROPUS GIGANTEUS, Bruenn.

The common Flying-Fox.

1782. *Vespertilio gigantea*, Bruennich. Dyrènes Historie I., p. 45.
1825. *Pteropus medius*, Temminck. Mon. Mamm. I., p. 176.
1870. *Pteropus kelaarti*, Gray. Cat. Monk. &c., p. 104.
1891. *Pteropus medius*, Blanford. Mammalia No. 134.

♂ 197, 199, 202, 208, 211. Pili Sipna Valley, Berars.

Dr. Knud Andersen, who has studied this group, in the preparation of a Catalogue of the Chiroptera, has pointed out to me that the name *giganteus* is nearly 50 years older than *medius*, and must be used for the common Flying-Fox of the plains; he is further of the opinion that the name *leucocephalus*, Hodgs. (with its synonym *assamensis*, McClell.) must be reserved for the Himalayan Flying-Fox. I have therefore omitted them from the synonymy of *giganteus*. The names *giganteus* and *medius* were both based on specimens from Bengal. The Ceylon Flying-Fox apparently differs in no way from that of the peninsula, and *kelaarti* is consequently retained in my synonymy above. Blanford quotes *edwardsi*, Is. Geoffroy, in his synonymy, but the use of this name by Is. Geoffroy was not original, for E. Geoffroy had already given the name, in 1810, to an outwardly somewhat similar, but perfectly distinct, species from Madagascar. The name must be dropped from the synonymy of the Indian Flying-Fox.

PIPISTRELLUS CEYLONICUS, Kel.

Kelaart's Pipistrelle.

(For synonymy, see Report No. 1.)

♂ 182. (in al.). ♀ 165 (in al.) . . . Chikalda, Berars.

(*Vide* also Report No. 1.)

PIPISTRELLUS DORMERI, Dobs.

Dormer's Pipistrelle.

(For synonymy, see Report No. 1.)

♂ 158. Chikalda, Berars.

(*Vide* also Report No. 1.)

PIPISTRELLUS MIMUS, Wrought.

The Southern dwarf Pipistrelle.

(For synonymy, see Report No. 1.)

♀ 166. (in al.) . . . Chikalda, Berars.

(*Vide* also Report No. 1.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

TAPHOZOUS MELANOPOGON, Temm.

The black-bearded sheath-tailed Bat.

(For synonymy, see Report No. 1.)

♂ 168, 169. ♀ 170, 171. Chikalda, Berars.

(*Vide* also Report No. 1.)

MUNGOS MUNGO, Gmel.

The common Indian Mungoose.

(For synonymy, see Report No. 1.)

♂ 156. ♀ 157. Ellichpur, Berars.

(*Vide* also Report No. 1.)

CUON DUKHUNENSIS, Sykes.

The Indian Wild-Dog.

1831. *Canis dukhunensis*, Sykes. P. Z. S., p. 100.
1833. *Canis primævus*, Hodgson. As. Res. XVIII, p. 221.
1863. *Cuon grayiformis*, Hodgson. Catalogue, 2nd Ed., p. 5.
1888. *Cyon dukhunensis*, Blanford. Mammalia No. 70.

♂ 185. Sembadoh, Berars.

♂ 220, 221. Pili Sipna Valley, Berars.

PETAURISTA ORAL, Tick.

The Central Indian Flying Squirrel.

1842. *Pteromys oral*, Tickell. Calc. Journ. N. H. II, p. 401.
1891. *Pteromys oral*, Blanford. Mammalia No. 227 (partim.)

♀ 194. Sembadoh, Berars.

♂ 218; ♀ 223. Pili Sipna Valley, Berars.

I published recently in this Journal (Vol. XX, p. 1012) a paper on the Oriental Flying Squirrels. I there felt obliged to merge the name *oral* in the synonymy of *philippensis*. The present specimens show that it is necessary to revive the former name. The proportions of these specimens are almost exactly those recorded by Tickell in the original description of his Singhboom specimen, and are markedly smaller than that of any other known species south of the Ganges. Otherwise these specimens do not quite agree with the description of *oral*. It seems to me best, however, to list it provisionally as *oral* until we have a topotype with which to compare it.

FUNAMBULUS PALMARUM, L.

The Palm Squirrel.

1766. *Sciurus palmarum*, Linnæus. Syst. Nat., p. 86.
1814. *Sciurus penicillatus*, Leach. Zool. Misc. I, p. 6.
1832. *Funambulus indicus*, Lesson. Ill. Zool. pl. xliii.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1891. *Sciurus palmarum*, Blanford. Mammalia No. 253 (partim).
♂ 159, 174. Chikalda, Berars.
♂ 225, ♀ 210, 224. Sipna Valley, Berars.

Here, as in the Surat District, where I originally took *pennanti*, that species occurs with *palmarum*.

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(For synonymy, see Report No. 1.)
♀ 191. Sembadoh, Berars.
♀ 216. Sipna Valley, Berars.
(*Vide* also Report No. 1.)

TATERA INDICA, Hardw.

The Indian Gerbil.

(For synonymy, see Report No. 1.)
♂ 179. Chikalda, Berars.
(*Vide* also Report No. 1.)

VANDELEURIA OLERACEA, Benn.

The Dekhan Tree-Mouse.

1832. *Mus oleraceus*, Bennett. P. Z. S., p. 121.
1859. *Mus badius*, Blyth. J. A. S. B., XXVIII, p. 295.
1867. *Mus nilagiricus*, Jerdon. Mamm. Ind., p. 203.
1891. *Vandeleuria oleracea*, Blanford. Mammalia No. 270.
♂ 163. Chikalda, Berars.

The species was based by Bennett on a specimen collected by Col. Sykes in the Dekhan. The names *dumecola*, *dumeticola*, and *povensis*, Hodgson, represent the Nepal form (*dumecola* was not *described* and *povensis*, a later name, was probably a young specimen); *Vandeleuria dumeticola* must therefore stand for the northern form (dark but bright tawny) which undoubtedly is distinct from *oleracea*. Of *badius* from Tenasserim and *nilagiricus* of the Nilgiris, no specimens are available for examination, and I therefore leave those names provisionally in the synonymy of *oleracea*.

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

(For synonymy, see Report No. 1.)
♂ 176, 178, 184. Chikalda, Berars.
♂ 203, 204, 209. Sipna Valley, Berars.
♂ 230; ♀ 231. Harisel, Berars.
(*Vide* also Report No. 1.)

A very even series, quite like the specimens from Khandesh.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

EPIMYS BLANFORDI, Thos.

The white-tailed Rat.

1881. *Mus blanfordi*, Thomas: A. N. N. H. (5) VII, p. 24.
1891. *Mus blanfordi*, Blanford: Mammalia No. 278.

♂ 195; ♀ 189. Sembadoh, Berars.
♂ 217; ♀ 198, 212, 213, 227. Sipna Valley, Berars.

The species was based on a somewhat immature ♀, in spirit, from Cuddapah, Madras Presidency. A little later Mr. Thomas received a second spirit specimen, a full grown ♂, also collected by Col. Beddome, and published revised measurements (P. Z. S. 1881, p. 541). Since then our Society has received specimens collected by Mr. Woosnam at Matheran, and Mr. Kinnear at Karwar, and Sai, Kolaba District, and the British Museum has a series collected by Col. Ward at Mandla. C. P. These last appear to be rather larger than any of the rest, otherwise all appear to agree together fairly well.

LEGGADA PLATYTHRIX, Benn.

The Dekhan Spiny-Mouse.

(For synonymy, see Report No. 1.)

♀ 172, 177, 180. Chikalda, Berars.
♂ 200 215; ♀ 205, 214. Pili Sipna Valley, Berars.

(*Vide* also Report No. 1.)

The British Museum has a spirit specimen collected by Col. Sykes, and two skin specimens collected by the Rev. Mr. Fairbank at Ahmednagar. The present series, though not altogether agreeing with these typical specimens, is so near them that, for the present, at any rate, it must rank as *platythrix*.

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

(For synonymy, see Report No. 1.)

♂ 206, 207; ♀ 201. Pili Sipna Valley, Berars.
♂ 228. Kolkaz Sipna Valley, Berars.

(*Vide* also Report No. 1.)

I am not satisfied that these are true *booduga*, but the material of the latter species is so incomplete that I provisionally list them under that name.

GOLUNDA ELLIOTI, Gray.

The Indian Bush-Rat.

(For synonymy, see Report No. 1.)

♂ 183. Chikalda, Berars.

(*Vide* also Report No. 1.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LEPUS SIMCOXI, Wrought.

The Khandesh Hare.

(For synonymy, see Report No. 1.)

♂ 160, 173; ♀ 167. Chikalda, Berars.

(*Vide* also Report No. 1.)

MUNTIACUS VAGINALIS, Bodd.

The Barking Deer.

1785. *Cervus vaginalis*, Boddaert. Elench. Anim. I., p. 136.
1816. *Cervus subcornutus*, de Blainville. Bull. Soc. Phil., p. 77.
1827. *Cervus aureus*, Hamilton Smith. Griffith's An. Kingd. IV., p. 148
1829. *Cervus ratwa*, Hodgson. As. Res. XVIII., pt. 2, p. 139.
1839. *Cervus melas*, Ogilby. Royle's Bot. Himal., p. LXIII.
1844. *Cervus stylocerus*, Wagner. Schreb: Saüg. Supp. IV., p. 392.
1844. *Cervus albipes*, Wagner, l. c., p. 394.
1872. *Cervulus tamulicus*, Gray. Cat. Rum. Mamm., p. 94.
1891. *Cervulus muntjac*, Blanford. Mammalia No. 362.
1904. *Cervulus grandicornis*, Lyddeker. Field. CIV., p. 780.

♀ 188. Chikalda, Berars.

♀ 193, 196. Sembadoh, Berars.

♂ 222. Pili Sipna Valley, Berars.

Zimmermann's *muntjak* (1780), Blainville's *moschatus* (1816), Gray's *curvostylis* (1872) and Kohlbrugge's *pleiharicus* (1896) were based on Javan, Sumatran, Siamese, and Bornean forms respectively, and must be excluded from the synonymy of the Indian species. The oldest name given to the continental species is *vaginalis*. The names *subcornutus* and *aureus* were based on animals of unknown habitat, but *ratwa, melas, albipes, tamulicus*, and *grandicornis* are names available should any of the forms from the following localities prove to be separable from the Bengal 'Kakar', *viz.*:—Nepal, W. Himalaya, Poona Ghats, Southern India (S. M. Country) and Tenasserim.

TETRACEROS QUADRICORNIS, Blainv.

The four-horned Antelope.

1816. *Antelope* (*Cervicapara*) *quadricornis*, Blainville, Bull. Soc. Phil., p. 78.
1825. *Antelope chickara*, Hardwicke. Trans. L. S. XIV., p. 520.
1839. *Antelope subquadricornutus*, Elliot. Madr. Journ. L. & S. X., p. 225.
1847. *Tetraceros iodes*, Hodgson. Calc. Journ. N. H. VIII., p. 90.
1847. *Tetraceros paccerois*, Hodgson. l. c.
1891. *Tetraceros quadricornis*, Blanford. Mammalia No. 356.

♂ 186. ♀ 190. Sembadoh, Berars.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

COLLECTION ...	... No. 3.
LOCALITY	... Cutch.
DATE	... July-August.
COLLECTED BY ...	... Mr. C. A. Crump.
EARLIER REPORTS ...	... No. 1, E. Khandesh, Vol. XXI, p. 392 (1912). No. 2, Berars, Vol. XXI, p. 820 (1912).

This Collection was made in the Cutch State, which lies on the Tropic of Cancer, between 68° and 71° East longitude, on the West Coast, from which it is separated by the two Runns (Great and Little). The subsoil of Cutch is composed of stratified rocks of various ages and is covered with recent or subrecent deposits, both wind and water borne, of which the principal are sand and alluvium. Rainfall is very light, intervals of years without rain being known, the fall at Bhuj is said to average about 12 inches. The area collected over is for the most part an alluvial plain, bounded northward and westward by ranges of hills rising in some cases to an altitude of 2,000 feet. Except for some scanty bush growth on these hills, a few large trees in Bhuj and Anjar, and patches of babhul jungle scattered about, for the most part near Tanks (notably an area near the large Tank at Charwa), the whole country is treeless.

In addition to information from the Gazetteer, which I have used in the above description, Mr. Crump furnishes the following detailed descriptions :—

"Bhuj lies in a saucer and its surroundings appear to me to be as varied as can be found in Cutch State. To the W. and N., beyond 10 miles of undulating country, are ranges of mountains. There is an old Fort which harbours many Bats, situated on an isolated hill immediately overlooking the City. Just outside the City walls is a garden, kept up by the State, which is crowded with flourishing trees and shrubs, together with a profusion of flowers."

"Rhoda Motha lies about 10 miles to the North of Bhuj, immediately beyond it limestone and trap hills rise suddenly from a plain of fine sand. Babhul and Pricklypear grow in small patches."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"Nokania, about 3 miles from Rhoda Motha, has very varied surroundings. A large Tank, with a good patch of Babhul and Pricklypear jungle, affords good cover, the rest of the surrounding country is sandy plain, dotted with bushes, and in one direction a wide area of cultivated land."

"Dhonsa is mainly surrounded by cultivation, it has a low range of limestone hills on one side, where some rodents were obtained, but from the rest the results were small."

"Charwa, on the Bhuj side, has rolling hills covered with dense babhul jungle. A fine Tank, 4 or 5 miles round, has been formed by the erection of a bund. Here the trees are larger and the undergrowth thick, affording excellent cover for Leopards (which have been introduced), Pigs, Jackals, etc. Below the Tank is a well stocked garden, and beyond that for some miles jungle growth, confined to a good wide Nullah. The rest of the country is a sandy plain with low rocky hills rising from it. Towards the Bunnee is a large amphitheatre of hills in the midst of which is some good cultivation, surrounded by fair grazing grounds for sheep and cattle. It is here and along the North Coast that Wolves are common."

"Pirwadi is near and very like Dhonsa. The wells have dried up and it is now deserted."

"Anjar is a large town, containing some fine trees. It is surrounded by a flat stretch of cultivated land, which even extended to Kharirobar on the Coast."

"Shikarpur is on the South Coast, eastward from Kharirobar, it is in the midst of cultivation which extends to Markhed and Nanda."

"Poungbe is separated from Nanda by a salt plain, which is covered with water during the monsoon. It is a low plateau with a large central depression, which after the monsoon is covered with long grass giving excellent grazing to cattle, Wild Asses, Pigs and Blackbuck. Apart from grass there is absolutely no cover."

"Padampur has good cultivation around it, and a fairly thick crub jungle on undulating and broken ground. Close by is a group of low hills rising out of fine sand."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"Chitrod is surrounded by an undulating plain, quite bare of trees and mostly under cultivation. On the road to Jhangi the country is still flatter, and almost entirely under cultivation."

C. A. C.

This is a large and most interesting collection. There are 355 specimens divided among 38 species in 28 genera. As was to be expected, from the geographical position of Cutch, the collection is representative of a somewhat different fauna from those of Khandesh and the Berars.

Out of the 38 species 10 are distinctly Northern forms, *viz.*, the two Hedgehogs, the Desert Cat, the Desert Gerbil, the two ashy Spiny Mice, the Northern Field Mouse, the Cutch Rock Rat, the Sind Hare and the Rajputana Porcupine. The Mongoose is a transition form, some of the specimens show distinct signs of the red colouring which characterises *sanguinea*, Blanford, from Sind, while others are quite typical *mungo*. The majority of the species however apparently represent forms equally at home both in the north and the south. Exactly to what extent this is so it remains for further collections to decide.

The majority of these "Southern" forms have already been obtained by the "Mammal Survey" in Khandesh and the Berars, but a few are new to the list, *e.g.*, the bicoloured leaf-nosed Bat and the mouse-tailed Bats, the Caracal, the Civet, the Wolf, the Ratel, and the Pangolin.

Topotypes of the Cutch sheath-tailed Bat have now been obtained; until Mr. Crump collected this Bat at Ajanta, Hyderabad State, it had not I believe been taken since Stoliczka's visit to Cutch about 1870.

Five forms are new to science:—The fine mouse-tailed Bat, whose nearest relative is found in Sumatra, which I have named after Mr. Kinnear, our hardworking Curator. The interesting long-tailed Rat for which I have had to provide a new Genus, as well as a new Species. I have named it *Cremnomys cutchicus*. The Generic name is best translated "Rock Rat" while the Specific name is given in honour of H. H. the Rao of Cutch, to whose good-will we owe this collection and under whose immediate patronage it was made. The two mice, *viz.*, the smaller ashy Spiny

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mouse and the northern Field Mouse, and finally the Rajputana Porcupine.

Mr. Crump has collected and recorded a number of observations in connection with the specimens, from which I have prepared short notes and incorporated them in the report over Mr. Crump's initials.

H. H. the Rao has furnished a list of Cutchee names which have also been recorded.

PTEROPUS GIGANTEUS, Bruenn.

The common Flying-Fox.

(For synonymy, see Report No. 2.)

♂ 349. Charwa, Cutch.

♂ 407, 409 ; ♀ 406, 408. Bhuj, Cutch.

(*Vide* also Report No. 2.)

Vernacular name—WADWAGHAN. (*H. H. the Rao.*)

["Extremely local. There is a colony at Bhuj which roosts in the City, repairing for food to H. H. the Rao's Garden, some even wandering to Charwa, 10 miles away. It is said they are also to be found at Anjar, where there are some large trees."—C. A. C.]

HIPPOSIDEROS FULVUS, Gray.

The bicoloured leaf-nosed Bat.

1838. *Hipposideros fulvus*, Gray. Mag. Zool. Bot. II., p. 492.
1838. *Hipposideros murinus*, Gray. l. c.
1839. *Rhinolophus murinus*, Elliot. Madr. Journ. L. & S. X., p. 99.
1839. *Rhinolophus fulgens*, Elliot. l. c.
1848. *Hipposideros ater*, Templeton. J. A. S. B. XVII., p. 252.
1852. *Hipposideros atratus*, Kelaart. Prod. Faun. Zeyl., p. 16.
1853. *Hipposideros cineraceus*, Blyth. J. A. S. B. XXII., p. 410.
1891. *Hipposiderus bicolor*, Blanford. Mammalia No. 166.
♂ 435, ♀ 421, 439, 446, 447. Bhuj, Cutch.

Temminck's *bicolor* was named from Java, it is a distinct species with smaller ears. I took some specimens near Darjeeling in 1891. The name must be removed from the synonymy of the present bat. Gray named two species, *fulvus* and *murinus*, on specimens sent to him by Elliot, from the Southern Mahratha Country; they were colour phases of one species, a thing not uncommon amongst the *Rhinolophidæ*. A year later Elliot described, presumably the same two forms, under the names *murinus* and *fulgens*. The names *ater*, Templeton, and its modification *atratus*, Kelaart, represent the Ceylon form of the present species and must remain in its synonymy until we have material to show that it is separable. Blyth described *cineraceus* from Pind Dadan Khan in the Punjaub, he states that it is larger than

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

murinus, Elliot' but quotes for it a markedly shorter forearm, without topotypes for comparison I must leave the name in the synonymy of *fulvus*

Vernacular name—CHAMDA. (*H.H. the Rao.*)

[" These specimens formed the whole colony of one cave. They hung from the roof by their hind legs and did not cling or crawl on the wall."—C.A.C.]

SCOTOPHILUS KUHLI, Leach.

The common yellow Bat.

(For synonymy, see Report No. 1.)

♀ 309, 312, 327 (in al.)....Bhuj, Cutch.

(*Vide* also Report No. 1.)

These specimens are undoubtedly *kuhli* though a trifle smaller and somewhat differently coloured from those received from Khandesh.

Vernacular name—CHAMDA. (*H. H. the Rao.*)

PIPISTRELLUS CEYLONICUS, Kel.

Kelaarts Pipistrelle.

(For synonymy, see Report No. 1.)

♂ 452. Bhuj, Cutch.

♀ 383 (in al.) Charwa, Cutch.

(*Vide* also Report No. 1.)

It is a pity only one specimen was obtained; had there been a series I should have had no hesitation in separating this as a distinct local race, so different is this one from more southern specimens.

Vernacular name—CHAMDA. (*H. H. the Rao.*)

PIPISTRELLUS DORMERI, Dobs.

Dormer's Bat.

(For synonymy, see Report No. 1.)

♂ 316 (in al.) 530 (imm.), 561 (imm.), ♀ 320, 329, 343 (in al.) 555. Bhuj, Cutch.

(*Vide* also Report Nos. 1 and 2.)

Vernacular name—CHAMDA. (*H. H. the Rao.*)

TAPHOZOUS MELANOPOGON, Temm.

The black-bearded sheath-tailed Bat.

(For synonymy, see Report No. 1.)

♂ 300 (in al.), 425 (in al.), 454 (albine), 466, 467, 468, 469, 470, 471, 526, 527, 535, 545, 558, 559, 569, 570, 571, 572, 575, 576, 577, 578, 580, 581, 582, 583, 584, 585, 586, 589, 591, 592, 594, 595, 596.

♀ 422, 423, 424, 426 (in al.), 428, 429, 430, 431 (in al.), 432, 433, 440, 472, 473, 560, 573, 574, 587, 590, 593, Bhuj. Cutch.

(*Vide* also Reports Nos. 1 and 2.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This is a very even series and differs somewhat in colour from the Khandesh specimens, which latter quite resemble some specimens, in the National Collection, from Bombay. (Kennery Caves.)

Vernacular name—CHAMDA. (*H. H. the Rao.*)

["These were taken from a small Tomb. They cling to the wall and crawl about with great ease, their flight is rapid."—C. A. C.]

TAPHOZOUS KACHHENSIS, Dobs.

The Cutch sheath-tailed Bat.

(For synonymy, see Report No. 1.)

♂ 541, 546, 551 ; ♀ 532, 533, 534, 540, 547, 548, 549, 550, 552, 553 (in al.), 554 (in al.), 588. Bhuj, Cutch.

(*Vide* also Report No. 1.)

These specimens are topotypes of Dobson's *kachhensis*, they do not appear to differ in any way from those obtained at Ajanta.

["These bats were found in a tomb, both sexes together, no other species with them ; all were full grown but some were undoubtedly of this season. They cling rather than hang and can crawl backwards up a wall with fair speed, using thumbs as well as feet. They are very noisy, especially in the evening just before emerging into the open."

"I several times observed this species searching round bushes for food, it hovers over the bush and actually settles for a fraction of a second, while picking an insect from among the foliage, immediately afterwards, as it flies over-head a distinct clicking sound can be heard as if a beetle or some other hard substance were being chewed."—C. A. C.]

RHINOPOMA HARDWICKII, Gray.

The lesser Indian mouse-tailed Bat.

1831. *Rhinopoma hardwickii*, Gray. Zool. Misc., p. 37.

1891. *Rhinopoma microphyllum*, Blanford. Mammalia No. 223 (*partim*).

♂ 323, 525, 564 ; ♀ 455, 456, 465, 528, 529, 557.

RHINOPOMA KINNEARI, Wroughton.

The greater Indian mouse-tailed Bat.

1891. *Rhinopoma microphyllum*, Blanford. Mammalia No. 223. (*partim.*)

1912. *Rhinopoma kinneari*, Wroughton. Journ. B.N.H.S., Vol. XXI p. 767.

♂ 457, 458, 459, 460 (in al.), 463 (in al.), 464 (in al.), 475 (in al.), 476 (in al.), 478, 479, 579. Bhuj, Cutch.

["These long-tailed bats are common near Bhuj, they are high but not rapid fliers."—C. A. C.]

NYCTINOMUS TRAGATUS, Dobs.

Dobson's wrinkled-lipped Bat.

1874. *Nyctinomus tragatus*, Dobson. J. A. S. B. XLIII., 2., p. 143.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1891. *Nyctinomus tragatus*, Blanford. Mammalia No. 224.
♂ 536, 538; ♀ 453, 537, 539, 542, 543, 544. Bhuj, Cutch.

The type, a spirit specimen in the Indian Museum, is said to have been taken at Calcutta. The National Collection has only 3 specimens, from known localities so far apart as the Punjaub and the Malabar Coast.

Vernacular name—CHAMDA. (*H. H. the Rao.*)

["These bats were found singly, or two or three together, in cracks in walls or in narrow spaces, formed by slabs of stone leaning against walls. They do not hang suspended from a roof but cling, in inverted position often quite wedged in the crevice; they make a low clicking noise when disturbed and have a quick flight."—C. A. C.]

ERINACEUS COLLARIS, Gray and Hardw.

Hardwicke's Hedgehog.

1830. *Erinaceus collaris*, Gray and Hardwicke. Ill. Ind. Zool. I, pl. 8.
1832. *Erinaceus spatangus*, Bennett. P. Z. S., p. 123.
1832. *Erinaceus grayi*, Bennett. P., Z. S., p. 124.
1839. *Erinaceus indicus*, Royle. Ill. Ind. Zool. (*nomen nudum*).
1888. *Erinaceus collaris*, Blanford. Mammalia No. 104.
♂ 240, 303, 305, 306, 346, 484; ♀ 304, 345, 347, 483, 486, 487, 565. Bhuj, Cutch.
♂ 266. Nokania, Cutch.

I dealt recently with the synonymy of this species, in this Journal (Vol. XX., p. 80), and there is nothing more to be done until a series of topotypes from the Doab is available for comparison.

Vernacular name—SEVRO, SEWRA. (*H. H. the Rao.*)

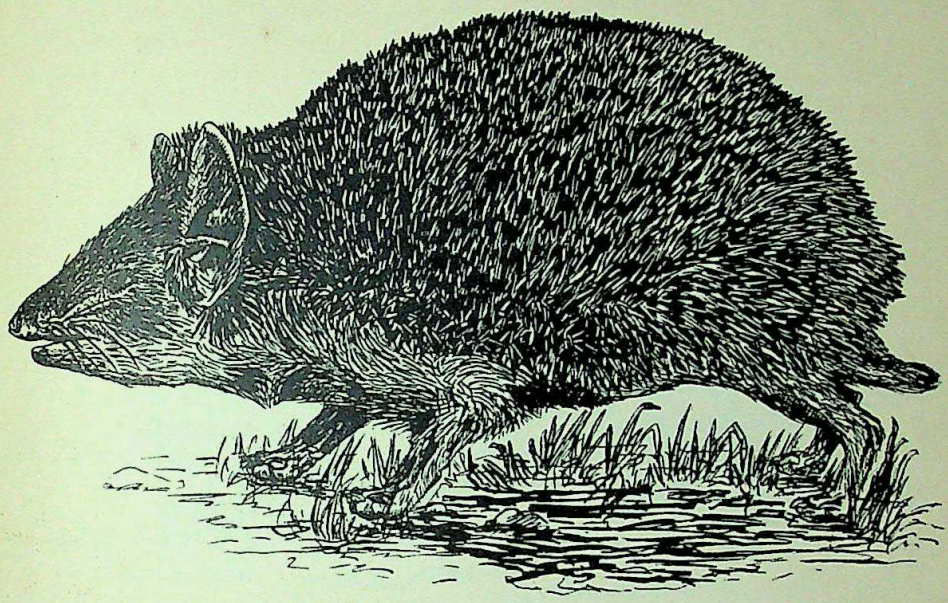
["Hedgehogs seem to be very local in their distribution. They are quite common near Bhuj, rarer in the north of the State, less so in the east, and very common again in the extreme east. The Hedgehog is entirely nocturnal. It hunts singly, keeping up a steady trot in its search for food and no doubt covering a considerable distance during a night.

When handled, they sometimes inflate and deflate themselves, making a noise like the rush of air from a pair of bellows. When face downwards and not tightly curled up they can jerk up the back: this method of defence is practised most frequently by the young. Some Hedgehogs I had in captivity fought occasionally, attacking each other's faces, and making a noise like angry kittens; two large males on one occasion fought until one was severely bitten under the ear and killed.

The local tradition says that the Jackal feeds on the Hedgehog; he turns the rolled up Hedgehog on his back and drops urine on him to make him open out. The Hedgehog is incapable of jumping even the shortest distance either up or down."—C. A. C.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Hardwicke's Hedgehog, Erinaceus collaris. ½ *nat. size.*

ERINACEUS MICROPUS, Blyth.

The Northern pale Hedgehog.

1846. *Erinaceus micropus*, Blyth. J. A. S. B. XV, p. 170.
1872. *Erinaceus pictus*, Stoliczka. J. A. S. B. XLI (2), p. 223.
1888. *Erinaceus pictus*, Blanford. Mammalia No. 107.
1910. *Erinaceus micropus*, Wroughton. Journ. B.N.H.S., Vol. XX, p. 80.
♀ 285. Nokania, Cutch.
♂ 299. ♀ 298. Dhonsa, Cutch.
♂ 302. 344, 348, 481, 482, 567; ♀ 300, 301, 480, 566, 588. Bhuj, Cutch.
♂ 500. Makhal, Cutch.
♂ 502. Nanda, Cutch.

As I recently pointed out in a paper (l. c.) in this Journal, the name *micropus*, used for the southern Hedgehog, by Blanford, was based by Blyth on a specimen from Bhawalpur, and applied to the present species; the name *pictus*, given by Stoliczka to the Cutch species being sunk as a synonym, that form not being separable from the Bhawalpur Hedgehog.

Vernacular name—SEVRO, SEWRA. (*H. H. the Rao.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The Northern pale Hedgehog, Erinaceus micropus. ½ nat. size.

The above drawing of the Northern pale Hedgehog is hardly light enough in comparison with that of Hardwicke's Hedgehog on the preceding page.

These two hedgehogs can readily be distinguished by the difference in colour, Hardwicke's being dark and the Northern pale, as its name implies, light. Besides colour the two species are at once separated by the absence in Hardwicke's of a naked furrow in the middle of the head, which, as can be seen in the drawing, is very distinct in the Northern pale Hedgehog.

PACHYURA, sp.

Shrews.

♂ 331. 404, 413, 414, 415; ♀ 332, 405, 444. Bhuj, Cutch.
♂ 477. Bhuj, Cutch.
♀ 284. Nokania, Cutch.

(*Vide* also Report No. 1.)

Vernacular name—ANDHI-CHHUNCHH. (*H. H. the Rao.*)

["Musk shrews are fairly common. Two kept in captivity showed great dexterity in catching flies on the wing, raising themselves on their hind legs, and with quick movements of the head, snapping at the flies."—C. A. C.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FELIS AFFINIS, Gray and Hardw.

The Jungle Cat.

(For synonymy, see Report No. I.)

♂ 264. ♀ 264. Nokania, Cutch.

♀ 326. Bhuj, Cutch.

♂ 365. 376, 387; ♀ 367. Charwa, Cutch.

♀ 523. Chitrod, Cutch.

(*Vide* also Report No. 1.)

Vernacular name—JHANG-MENO. (*H. H. the Rao.*)

["Common wherever there is sufficient cover. It is chiefly nocturnal."—C. A. C.]

FELIS ORNATA, Gray and Hardw.

The Indian Desert Cat.

1832. *Felis ornata*, Gray and Hardwicke. Ill. Ind. Zool. I, pl. 2.

1837. *Felis servalina*, Jardine. Nat. Libr., II, p. 232.

♂ 241. Bhuj, Cutch.

Vernacular name—JHANG-MENO. (*H. H. the Rao.*)

["One specimen only was obtained, shot over the carcase of a fresh killed sheep. I believe it to be commoner than is supposed, judging from the number of cat-tracks found in quite open ground round burrows of the Gerbil, where *affinis* is unlikely to have gone."—C. A. C.]

FELIS CARACAL, Guld.

The Caracal.

1776. *Felis caracal*, Guldenstadt. Nov. Com. Pet. XX, p. 500.

1888. *Felis caracal*, Blanford. Mammalia No. 42.

♂ 289. Dhonsa, Cutch.

♀ 403. Bhuj, Cutch.

Vernacular name—HAYANATRO. (*H. H. the Rao.*)

["Reported to be fairly common in the N. and N. W. Hills."—C. A. C.]

VIVERRICULA MALACCENSIS, Gmel.

The small Indian Civet.

1788. *Viverra malaccensis*, Gmelin. Syst. Nat. I, p. 92.

1817. *Viverra indica*, Geoffroy. Desm. Nouv. Dict. VII, p. 170.

1832. *Viverra bengalensis*, Gray and Hardwicke. Ill. Ind. Zool. I, pl. 4.

1832. *Viverra pallida*, Gray. P. Z. S., p. 63.

1888. *Viverricula malaccensis*, Blanford. Mammalia No. 48.

♂ 297. Dhonsa, Cutch.

♀ 485. Bhuj, Cutch.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Horsfield's name *rasse* must be left out of the synonymy of this species, it belongs to the Javan species which is distinct.

These specimens might have been expected to fall into the sub-species *deserti*, Bonhote, from Rajputana, but neither in colouration nor skull characters do they resemble Bonhote's type. One of the specimens is an extraordinarily aged individual, the molars being worn entirely away, their roots only showing beyond the jaw.

Vernacular name—JABADIO. (*H. H. the Rao.*)

"This Civet is nocturnal and very shy."—C. A. C.]

MUNGOS MUNGO, Gmel.

The common Indian Mongoose.

(For synonymy see Report No. 1.)

♂ 252, 339. Bhuj, Cutch.

♂ 253, 270, 277 ; ♀ 267, 269. Nokania, Cutch.

♂ 293. Dhonsa, Cutch.

♂ 373 ; ♀ 354, 355, 392. Charwa, Cutch.

♀ 400. Perwadi, Cutch.

(*Vide* also Reports Nos. 1 & 2.)

Vernacular name—NORIYO. (*H. H. the Rao.*)

["The Mongoose is very common in Cutch, particularly in the north, rarer towards the east coast. It lives under rocks and in holes, apparently dug by itself, it is diurnal, very bold, though wary, and excessively inquisitive; it rarely goes any distance from cover. It climbs well. When trapped it screams loudly, but normally anger is shown by arching the back and a growl like a cat."

"I was told by an eye witness that a mongoose attacked a snake which was coiled round a branch near the ground, the snake kept the mongoose off for some time, until the latter retired out of sight. The snake then descended to the ground and the mongoose, with a lightning-like rush from a neighbouring bush seized it by the head."—C. A. C.]

H. H. the Rao in a note to Mr. Crump expresses the opinion—

(1) that the mongoose we get here has "a white tip to its tail, and is not the same as the one commonly met with elsewhere in India which has a distinct black tip to its tail." I think H. H. must have been thinking of *Mungos smithi*, a quite distinct and somewhat larger animal, which is the only mongoose in India with a distinct black tip to its tail. The present specimens seem to average a shade smaller than those from Khandesh and Berar, and have a very slightly more reddish colouration in the bars across the tail than is found in the latter.

2) "The Cutch mongoose is probably the same one as in Sindh." The North Sind mongoose (i. e., *ferrugineus*, Blanford) is strikingly different in its general bright rufous colouration and red tail-tip.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Some Rajputana specimens in the National Collection seem to be intermediate between *ferrugineus* and true *mungo* as represented by the present series and the specimens from Khandesh and the Berars.

HYÆNA HYÆNA, L.

The striped Hyæna.

(For synonymy, see Report No. 1.)

♂ 259, 282. Nokania, Cutch.

♂ 330; ♀ 328. Bhuj, Cutch.

(*Vide* also Report No. 1.)

CANIS PALLIPES, Sykes.

The Indian Wolf.

1831. *Canis pallipes*, Sykes. P. Z. S., p. 101.

1888. *Canis pallipes*, Blanford. Mammalia No. 68.

♂ 390; ♀ 391. Charwa, Cutch.

Vernacular name—BHAGAD. (*H. H. the Rao.*)

["The Wolf is common along the North Coast of Cutch especially so in the Bunnee, where he preys on the sheep sent there to graze. I saw a pack of seven at Rhoda Motha, and another of eight near Charwa from which the two specimens were obtained. In the north of the State many sheep are killed by wolves. In the Bunnee, Wolves are said to attack Shepherds occasionally but are easily driven off with sticks. So far as I could learn, Wolves are very rare in the South of Cutch and are unknown in the East."—C. A. C.]

CANIS INDICUS, Hodgs.

The common Indian Jackal.

1833. *Canis aureus indicus*, Hodgson. As. Res. XVIII, p. 237.

1888. *Canis aureus*, Blanford. Mammalia No. 69.

♀ 245, 248. Rhoda Motha, Cutch.

♀ 278, 286. Nokania, Cutch.

♂ 314. Bhuj, Cutch.

♂ 375; ♀ 386. Charwa, Cutch.

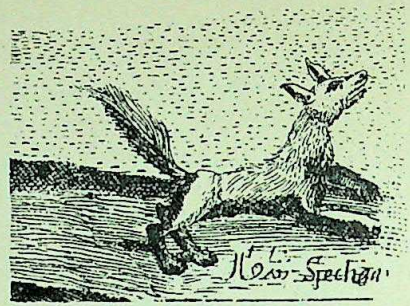
♀ 503. Nanda, Cutch.

(*Vide* also Report No. 1.)

Linnæus in describing *aureus* writes "nitide flavus . . . . Descriptio vera animalis etiamnum defecit." He had never seen the animal either dead or alive, but based his recognition of it on an account by Kæmpfer of an animal seen by him in the Province of Lar, on the Persian Gulf. While giving a long account of its habits, &c., Kæmpfer gave no detailed description of the animal itself, he furnished however a figure of which I give an exact reproduction here.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Kæmpfer's figure of the Persian Gulf Jackal (1712) on which Linnæus based his *Canis aureus* (1756).

After trying for several years, our Society has at last succeeded in obtaining two specimens from Bunder Abbas, which it has presented to the National Collection, and which may, I think, be confidently accepted as topotypes.

Basing on these it appears that the true *aureus* of S. Persia differs considerably from the Indian Jackal. The bases of the hairs, in the former are white, while in the latter, they are yellow or some shade of brown. The face and ears (externally) of all Indian Jackals which I have seen are bright tawny, while in the Persian Gulf *aureus* the face is grizzled buff and black and the ears are pinkish-buff.

In their skulls the two forms differ but little. In the Indian form, however, the teeth between the carnassial and the canine (upper) have spaces between them, while in true *aureus* they touch one another and even to a slight extent overlap. The result of this in the living animal must be that the Indian Jackal has a longer muzzle, which is just what would have been expected by anyone familiar with dog-breeding in India.

I give here for easy reference a comparative table of some skull measurements :—

—	*aureus*, Persian Gulf.	*indicus*, Nepal.	*indicus*, Khandesh.	*indicus*, Cutch.
Condylo-basal length ..	145	148	154	149
Basilar length	133	140	142	138
Greatest breadth	81	88	85	83
Nasals length	49	54	52	55
Palatilar length	70	74	75	72
M^2 to front of canine ..	62	66	69	66

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I propose to drop the name *aureus* altogether for the Indian Jackal and to adopt provisionally Hodgson's name *indicus*. I advisedly use the word provisionally, for until much more material is available we are not in a position to assume that the Jackal remains absolutely unchanged throughout all India, indeed so far as I am now able to judge such is not the case.

Vernacular name—SIYAD. (*H. H. the Rao.*)

[" Jackals are extremely common all over Cutch. They are very susceptible to rabies".—C. A. C.]

VULPES BENGALENSIS, Shaw.

The common Indian Fox.

(For synonymy, see Report No. 1.)

♂ 239 ; ♀ 238. Bhuj, Cutch.

(*Vide* also Report No. 1.)

Vernacular name—LONKDO (*H. H. the Rao.*)

VULPES LEUCOPUS, Blyth.

The Indian desert Fox.

1854. *Vulpes leucopus*, Blyth. J. A. S. B., XXIII, p. 729.

♀ 268. Nokania, Cutch.

My identification of this specimen is not satisfactory, but, without more material, I have no option but to label it *V. leucopus*. I cannot agree with Blanford that *griffithi* and *pusilla* are identical with *leucopus*. If the latter name ultimately proves to be synonymous with *leucopus*, it will take its place as the name of the species, with *leucopus* as a synonym, for *pusilla* is the older.

Vernacular name—LONKDO. (*H. H. the Rao.*)

MELLIVORA INDICA, Kerr.

The Indian Ratel.

1792. *Ursus indicus*, Kerr. Anim. Kingd., p. 188.

1834. *Ursitaxus inauritus*, Hodgson. As. Res. XIX, p. 61

1888. *Mellivora indica*, Blanford. Mammalia No. 89.

♂ 287. Dhonsa, Cutch.

♂ 333. Bhuj, Cutch.

Vernacular name—GHURNAR. (*H. H. the Rao.*)

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(For synonymy, see Report No. 1.)

♂ 262, 263 ; ♀ 258. Nokania, Cutch.

♂ 340, 341 ; ♀ 313, 402. Bhuj, Cutch.

♀ 362. Charwa, Cutch.

(*Vide* also Reports Nos. 1 and 2.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Vernacular name—KHILODI. (*H. H. the Rao.*)

["Plentiful in Bhuj and Charwa, not very common in other parts, rare in the East."—C. A. C.]

MERIONES HURRIANÆ, Jerd.

The Indian desert Gerbil.

1867. *Gerbillus hurrianæ*, Jerdon. Mamm. Ind., p. 186.

1891. *Gerbillus hurrianæ*, Blanford. Mammalia No. 265.

♂ 243 ; ♀ 247, 254, 255. Rhoda Motha, Cutch.

♂ 265, 275. Nokonia, Cutch.

♂ 310, 318, 319 ; ♀ 308, 531, 556. Bhuj, Cutch.

♂ 353. Charwa, Cutch.

♀ 398. Pirwadi, Cutch.

♂ 520, 521 ; ♀ 519, 522. Chitrod, Cutch.

The names *indicus* and *erythrourus*, quoted by Blanford in the synonymy of this species, represent distinct species so that I have omitted them entirely. The present series seems to be quite typical.

Vernacular name—KHETRAU-UNDAR. (*H. H. the Rao.*)

["The common Gerbil of Cutch, found wherever the soil is light or sandy ; it is by no means entirely nocturnal, individuals may be seen burrowing or feeding at any time of the day, but especially in the morning. It often sits upright with the forefeet suspended but, with an upward jerk of its tail, it plunges into its burrow at the least alarm. It can move about fairly rapidly ; usually keeping the body close to the ground, it moves by a series of little leaps if seriously alarmed or pursued. It seems to trust a good deal to its close coloured resemblance to its surroundings to escape detection, and, when feeding, may be approached near enough to bring its slightest movements under observation. When feeding it sits upright and conveys, with great rapidity, pieces of grass to its incessantly working jaws.

My attempts to photograph it however were not a success.

Its burrows are in groups of 2 or 3 or more together, each burrow has several entrances, all leading to a central chamber, in which, after the rains, considerable stores of seeds are probably stored. A pair of adults inhabit each burrow and appear to resent the intrusion of strangers."—C. A. C.]

MILLARDIA MELTADA, Gray.

The soft-furred Field-Rat.

(For synonymy, see Report No. 1

♂ 242. Rhoda Notha, Cutch.

♀ 271, 272. Nokania, Cutch.

(*Vide* also Report No. 1.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CREMNOMYS CUTCHICUS, Wrought.

The Cutch Rock-Rat.

1912. *Cremnomys cutchicus*, Wroughton. Journ. B. N. H. S., Vol. XXI, p. 341.

♂ 249; ♀ 246, 250. Rhoda Motha, Cutch.

♂ 256, 274; ♀ 273. Nokania, Cutch.

♂ 288, 290, 291, 295; ♀ 292. Dhonsa, Cutch.

♂ 350, 356, 358, 359, 360, 369, 371, 372; ♀ 357, 378, 388. Charwa, Cutch.

♂ 394, 395; ♀ 396, 397, 399. Pirwadi, Cutch.

♂ 510; ♀ 509, 511, 512, 516, 517. Padampur, Cutch.

["These long-tailed Mice are found wherever there are rocky hills, particularly among limestone. They are nocturnal, and feed on grass, seeds, and the leaves of a small bush, and live under and among the rocks; they seem to be gregarious from the fact that in places large collections of droppings may be found in hollows under rocks."—C. A. C.]

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

(For synonymy, see Report No. 1.)

♂ 324, 325, 336, 416, 436, 438, 451; ♀ 311, 322, 334, 335, 337, 410, 411, 416, 417, 419, 439, 445, 474. Bhuj, Cutch.

♂ 504; ♀ 505. Adesar, Cutch.

(*Vide* also Reports Nos. 1 and 2.)

There appears to be no noticeable variation in the specimens so far received.

Vernacular name—GAMTI-UNDAR. (*H. H. the Rao.*)

["Rats are very common everywhere, they keep to huts and houses and are protected and fed by the Banyas."—C. A. C.]

MUS MUSCULUS, L.

The common House-Mouse.

♂ 437 (imm); ♀ 420. Bhuj, Cutch.

(*Vide* also Report No. 1.)

I must, much against the grain, still use this name though the present specimens bear little or no resemblance to true *musculus*. The names *dubius*, *homourus*, and *urbanus* of Hodgson appear to all represent a species not unlike these specimens but with such poor material it is impossible to differentiate. Good series of house mice from all over India are a great desideratum.

Vernacular name—UNDEDI. (*H. H. the Rao.*)

["House mice are not common in Cutch, but few were taken in Bhuj. They were reported from the North but not known in the East of the State."—C. A. C.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LEGGADA SADHU, Wrought.

The ashy Spiny Mouse.

1911. *Leggada platythrix sadhu*, Wroughton. Journ. B. N. H. S., Vol. XX. p. 1001.,

♂ 251. Rhoda Motha, Cutch.

♂ 294; ♀ 296. Dhensa, Cutch.

♂ 351¾, 379, 381, 384, 389; ♀ 352, 380. Charwa, Cutch.

♂ 508, 518. Padampur, Cutch.

This fine series shows that *sadhu* can no longer be classed as a sub-species of *platythrix*. It represents indeed a separate group characterised by the partial closing in of the mesopterygoid fossa behind the posterior nares and a mammary formula of 4-2-12.

["These spiny mice were found usually on dark, soft soil, among Babhul jungle and beneath fallen trees but always on hill sides. They are usually most plentiful near water."—C. A. C.]

LEGGADA CINDERELLA, Wrought.

The smaller ashy Spiny Mouse.

1912. *Leggada cinderella*, Wroughton. B. N. H. S. Vol. XXI, p. 770.

♂ 257, 280; ♂ 281. Rhoda Motha, Cutch.

♂ 307, 321, 482. Bhuj, Cutch.

♂ 377; ♂ 385. Charwa, Cutch.

♂ 507. Padampur, Cutch.

The type specimen of this species is an old female, of which the measurement of the head and body is recorded as 85 mm., other fully grown specimens measure 83, 84, etc. Among the specimens of *L. sadhu* collected by Mr. Crump, this measurement is recorded as 104 mm., in one, while scarcely any, and those immature, are under 88 mm.

LEGGADA DUNNI, Wrought.

The Northern Field-Mouse.

1891. *Mus booduga*, Blanford. Mammalia No. 287. (*partim*).

1912. *Leggada dunni*, Wroughton. Journ. B. N. H. S. *supra*. p. 339.

♂ 279. Nokania, Cutch.

A series collected by Major Dunn, R.A.M.C., has been waiting some time for separation from *booduga*. I have now described it earlier in the last number (No. 2, Vol. XXI) of the Journal. The present specimen belongs to the species. It has the under parts pure white as in some of the Ambala specimens.

GOLUNDA ELLIOTI, Gray.

The Indian Bush-Rat.

(For synonymy, see Report No. 1.)

♂ 366, 382. Charwa, Cutch.

(*Vide* also Reports Nos. 1 and 2.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LEPUS DAYANUS, Blanf.

The Sind Hare.

1874. *Lepus dayanus*, Blanford. P. Z. S., p. 663.

1884. *Lepus joongshaiensis*, Murray. Vert. Zool. Sind., p. 51.

♂ 401; ♀ 236, 237, 317. Bhuj, Cutch.

♂ 283. Nokania, Cutch.

♂ 342. Bhuj, Cutch.

♀ 361, 363, 364. Charwa, Cutch.

♂ 493; ♀ 488, 494. Anjar, Cutch.

♂ 498, 499. Makhal, Cutch.

♀ 513, 514. Padampur, Cutch.

Vernacular name—SAO. (*H. H. the Rao.*)

["Hares are very common throughout Cutch. They breed in June and July and again in September and October, having 1 or 2 young at a birth. The Shikaris assert that there are two species in Cutch, a larger and a smaller."—C. A. C.]

HYSTRIX CUNEICEPS, Wrought.

The Rajputana Porcupine.

1892. *Hystrix leucura*, Blanford. Mammalia. No. 315.

1912. *Hystrix leucura cuneiceps*, Wroughton. Journ. B. N. S., Vol. XXI. p. 771.

♀. 244. Rhoda Motha, Cutch.

♂. 261. Nokania, Cutch.

This form which I have described on an earlier page of this Journal is easily recognisable by its smaller size and its rusty colouration compared with the black of true *leucura* and by its wedge-shaped skull.

Vernacular name—SED. (*H. H. the Rao.*)

["In Cutch, porcupines seem to favour the shelter of rocks rather than making their own burrows. They are not known further East than Chitrod, are said to be rare to the S. E. of Bhuj, and comparatively common along the north coast, and the same round Charwa and to the West."—C. A. C.]

GAZELLA BENNETTI, Sykes.

The Indian Gazelle.

(For synonymy, see Report No. 1.)

♂ 489, 490, 491, 496, 497; ♀ 492, 495. Anjar, Cutch.

♀ 524. Chitrod, Cutch.

(*Vide* also Report No. 1.)

Vernacular names—CHINKARO, RATADIO, KAR-PUCHO. (*H. H. the Rao.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MANIS CRASSICAUDATA, G. St. Hil.

The Indian Pangolin.

1803. *Manis crassicaudata*, G. St. Hilaire. Cat. Mamm., p. 213.
1834. *Manis indicus*, Lesson. Suite. Mamm., IV., p. 520.
1842. *Manis (Phatagis) laticauda*, Sundevall. Vet. Ak. Handl., p. 258.
1872. *Pholidotus bengalensis*, Fitzinger. S. B. Ak. Wien., p. 64.

♂ 315. Bhuj, Cutch.

The name *pentadactyla* which was based on an animal from Formosa must be reserved for the Chinese Pangolin, as must *brachyura* for the same reason.

Vernacular name—CHHALO. (*H. H. the Rao.*)

COLLECTION	...	No. 4.
LOCALITY	...	Nimar.
DATE ...	...	November-December.
COLLECTED BY	...	Mr. C. A. Crump.
EARLIER REPORTS	...	No. 1, E. Khandesh, Vol. XXI, p. 392. No. 2, Berars, Vol. XXI, p. 820. No. 3, Cutch, Vol. XXI, p. 826.

Nimar, the district in which the present collection was made, is on the Satpura Plateau, about 21°-30′ N. Latitude, and 76°-20′ E. Longitude. The soil is the Dekhan trap. The country is much broken up into ranges of low hills. These are covered with the usual Satpura tree growth of *Boswellia* and *Hardwickia*, the intervening cultivation being mostly of Jawari. The annual rainfall is about 32 inches. The climate and topography of this district are sufficiently like those of E. Khandesh and the Berars to render it probable that it would carry much the same Fauna, and though a few species were obtained here for the first time, they were such as might, equally well, have been taken in either or both of the other localities.

The collection includes 170 specimens belonging to 27 species, in 22 genera; of these 4 are new to the list of species obtained by Mr. Crump so far, and one is new to science. Amongst the more interesting things are the two small shrews and the new mouse.

The former I have allotted to two species with considerable doubt. The *Pachyura* group of shrews, with 18 upper teeth, are found all over the plains of India and are represented by one species in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Europe, *Pachyura etrusca*, found on the Mediterranean littoral, and in Africa by *P. madagascariensis* from Madagascar, *P. leucura* from Zanzibar, and *P. gracilis* from South Africa. Curiously all these four species are pigmies, and closely related to the animal which I have here called *P. perrotteti*. I have heard it stated that the African species are constantly found in white ants' nests. I have a list of no less than 55 names already given to the representatives of the *Pachyura* group in India and until a very much larger and more representative collection of specimens is available for study, but little can be done to sort out this tangle of names.

The new mouse is most interesting. I have given a description of it on an earlier page. In its coat and some characters of the skull it closely resembles *Leggada platythrix*, its size however and dentition show it to be a true *Mus*. Unfortunately Mr. Crump only obtained one male specimen, a female specimen, showing the mammary formula, is a great desideratum ; it will be most interesting to discover whether in this character this animal is allied to *L. platythrix* with its 12 mammæ, or to *Mus* with only 10.

Mr. Crump seems to have had very great difficulty in trapping the smaller Rodents. He suggests that the harvest season, and the consequent abundance of food in the fields, may have been the reason. Mr. Crump also writes—"I have before observed that the Jungle Cat is by no means exclusively nocturnal, but in other places I have not seen them hunting regularly in broad daylight ; and I suggest that this change of tactics on the part of these cats at Hewra is because they feed principally on birds, owing to the scarcity of rats and mice."

Mr. Crump has recorded a number of local vernacular names, but as they are, with one exception, the same as those recorded by Blanford I have not entered them. The name "Bija" given for the lesser Civet must, I think, be a mistake, for it is one very generally used for the Indian Ratel.

PRESBYTIS ENTELLUS, Dufr.

The common Langur.

(Synonymy in No. 1.)

664. Hewra, Nimar.

(*See* also Reports 1 and 2.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

[" These Langurs, from the top of a very lofty tree can reach the ground in about four leaps or rather drops; these drops are made in quick succession, in an upright position, not, as a rule, on to heavy boughs but among the foliage. When alarmed and running through long grass they get along in great bounds, and while running, frequently raise themselves to their full height to look round. I saw young of all ages in one party—an old female was playing with her young one which she grasped by both hands, threw it in the air, and caught it again by the hands as it reached the ground.

"A dead monkey is one of the finest baits for Hyænas, Jackals and Cats."—C. A. C.]

PTEROPUS GIGANTEUS, Brunn.

The common Flying-Fox.

(Synonymy in No. 2.)

♂ 602. ♀ 603 .. .. Asirgarh, Nimar.

♂ 700. ♀ 697, 701 .. Siwal, Nimar.

(*See* Reports Nos. 2 and 3.)

CYNOPTERUS SPHINX, Vahl.

The short-nosed Fruit Bat.

1797. *Vespertilio sphinx*, Vahl. Skr. Nat. Selsk. IV., p. 123.

1797. *Vespertilio fibulatus*, Vahl. l. c., p. 124.

1803. *Pteropus pusillus*, E. Geoffroy. Cat. Mamm., p. 49.

1810. *Pteropus marginatus*, E. Geoffroy. Ann. Mus. XV., p. 97.

1870. *Cynopterus marginatus, ellioti*, Gray. Cat. Monk., &c., p. 122.

1891. *Cynopterus marginatus*, Blanford. Mammalia, No 138.

♀ 702 .. .. Mandva, Nimar.

Dr. K. Andersen has kindly examined this specimen; it is quite young, but there is no doubt that it is true *sphinx*.

LYRODERMA LYRA, Geoff.

The Indian Vampire Bat.

(Synonymy in No. 1.)

♂ (in al.) 609, 631, 632 .. .. Asirgarh, Nimar.

(Also *see* Report No. 1.)

TAPHOZOUS MELANOPOGON, Temm.

The black-bearded sheath-tailed Bat.

(Synonymy in No. 1.)

♂ 634, 638 (in al.), 641, 643, 652. ♀ 639 (in al.), 642, 653. Asirgarh, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

TAPHOZOUS THEOBALDI, Dobs.

Theobald's sheath-tailed Bat.

1872. *Taphozous theobaldi*, Dobson. P. A. S. B., p. 152.
1891. *Taphozous theobaldi*, Blanford. Mammalia, No. 219.
♂ 635, 644, 651 .. .. Asirgarh, Nimar.

This bat was described by Dobson on a specimen from Tenasserim. The British Museum has also a series from Java.

RHINOPOMA KINNEARI, Wrought.

The greater Indian Mouse-tailed Bat.

(Synonymy in No. 3.)

♂ 646, 649, 650, 655 (in al.). ♀ 633, 636, 637, 645, 647, 648, 656 (in al.), 657, 658 (in al.).

(*See* also Report No. 3.)

PACHYURA, sp.

Shrews.

♂ 711. ♀ 715, 724 .. .. Chandghar, Nimar.
♂ 731. .. .. Garoor, Nimar.

(*See* also Reports Nos. 1 and 3.)

PACHYURA STOLICZKANA, Anders.

Stoliczkas Shrew.

1877. *Crocidura stoliczkana*, Andersen. J. A. S. B. XLVI., p. 270.
1877. *Crocidura bidiana*, Andersen. J. A. S. B. XLVI., p. 276.
1888. *Crocidura bidiana*, Blanford. Mammalia, No. 120.
♀ 677 .. .. .. Hewra, Nimar.

If *stoliczkana* and *bidiana* are identical, clearly the former name must be accepted for the species. I record this identification with great misgiving.

PACHYURA PERROTTETI, Duvern.

The Indian pigmy Shrew.

1842. *Sorex perrotteti*, Devernoy. Mag. Zool., p. 29.
1855. *Sorex melanodon*, Blyth. J. A. S. B. XXIV., p. 33 (preoccupied.)
1855. *Sorex nudipes*, Blyth. l. c., p. 34.
1873. *Pachyura assamensis*, Andersen. P. Z. S., p. 232.
1877. *Crocidura macrotis*, Andersen. J. A. S. B. XLVI., p. 271.
1877. *Crocidura nitidofulva*, Andersen. l. c., p. 272.
1877. *Crocidura nilgirica*, Andersen. l. c., p. 274.
1877. *Crocidura travancorensis*, Andersen. l. c., p. 275.
1888. *Crocidura perrotteti*, Blanford. Mammalia, No. 125.
623. .. .. .. Asirgarh, Nimar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Blanford ranks all these pigmy shrews in two species, *viz.*, *Hodgsoni* and *perrotteti*, the former including the sub-Himalayan forms and the latter all the rest. The material at present is insufficient to justify any more exact treatment.

FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)

♀ 597, 601 .. .. Asirgarh, Nimar.
♂ 666, 669, 670, 672. ♀ 674 .. Hewra, Nimar.
♂ 717 .. .. Chandgarh, Nimar.
♂ 756 .. .. Garoor, Nimar.

(*See* also Reports Nos. 1 and 3.)

["*Felis affinis* was exceedingly common, and it was most noticeable that it was always on the move by day. Its movements can easily be followed by the piping of squirrels and the chirping of birds."—C. A. C.]

MUNGOS MUNGO, Gmel.

The common Indian Mongoose.

(Synonymy in No. 1.)

♂ 659. ♀ 627 .. .. Asirgarh, Nimar.
♂ 716 .. .. Chandgarh, Nimar.
♀ 728, 734 .. .. .. Garoor, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

["The Mongoose No. 728 was living in the trunk of a tree, the entrance being a narrow slit some 3 feet from the ground."—C. A. C.]

HYÆNA HYÆNA, L.

The striped Hyæna.

(Synonymy in No. 1.)

♂ 665. ♀ 663 .. .. Asirgarh, Nimar.

(*See* also Reports Nos. 1 and 2.)

CANIS INDICUS, Hodgs.

The Jackal.

(Synonymy in No. 1 under *C. aureus.*)

738, 747 .. .. Garoor, Nimar.

(*See* also Reports Nos. 1 and 3.)

CUON DUKHUNENSIS, Sykes.

The Indian Wild-Dog.

(Synonymy in No. 2.)

♂ 654. .. .. .. Asirgarh, Nimar.

(*See* also Report No. 2.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FUNAMBULUS PALMARUM, L.

The Palm Squirrel.

(Synonymy in No. 2.)

♂ 625 .. .. .. Asirgarh, Nimar.
♀ 683 .. .. .. Asirgarh, Nimar.
♀ 685, 691, 698, 699 .. Sival, Nimar.
♂ 735 .. .. .. Garoor, Nimar.

(*See* also Report No. 2.)

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(Synonymy in No. 1.)

♂ 626 .. .. Asirgarh, Nimar.
♀ 667, 668, 682 .. .. Hewra, Nimar.
♂ 720, 723, 721 (in al.) .. Chandghar, Nimar.
♂ 762, 765 .. .. .. Garoor, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

["I have been observing them (*Funambulus pennanti*) for a week and have never heard the shrill piping note so frequently uttered by the Palm Squirrels. These Squirrels have a low chirping or rather twittering note; they are exceedingly shy; they appear much redder in colour than the Palm Squirrel; the stripes are narrow and in life the coat is very glossy and lies very close."—C. A. C.]

TATERA INDICA, Hardw.

The Indian Gerbil.

(Synonymy in No. 1.)

♂ 621. ♀ 610, 611, 616 .. Asirgarh, Nimar.
♂ 660, 679. ♀ 661, 678 .. Hewra, Nimar.
♂ 689. ♀ 692 .. .. Sival, Nimar.
♂ 705. ♀ 706, 714.. .. Chandgarh, Nimar.

(*See* also Reports Nos. 1 and 2.)

VANDELEURIA OLERACEA.

The Dekhan Tree-Mouse.

(Synonymy in No. 2.)

♂ 693. ♀ 694 .. .. Sival, Nimar,
♂ 718, 725 .. .. .. Chandgarh, Nimar.

(*See* also Report No. 2.)

MUS PHILLIPSI, Wrought.

Phillips' spined Mouse.

1912. *Mus phillipsi*, Wroughton. Journ. B. N. H. Soc. Vol. XXI, p. 772.
♂ 618. Asirgarh, Nimar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This pretty little animal has, at first sight, a curiously close superficial resemblance to *Leggada platythrix*, but is really barely half the size of that species. The presence of frontal ridges on the skull add to this resemblance, but the dentition is so essentially that of *Mus* that its separation from *Leggada platythrix* cannot, for a moment, be in doubt.

Although the type was not taken in his District, I have great pleasure in naming it after Mr. R. M. Phillips, who has taken such great interest in the Field work of the Mammal Survey, and given such great assistance to our collector Mr. G. C. Shortridge.

LEGGADA PLATYTHRIX, Benn.

The Dekhan Spiny-Mouse.

(Synonymy in No. 1.)

♂ 612, 662 .. .. .. Asirgarh, Nimar.
♂ 676 .. .. Hewra, Nimar.

(*See* also Reports Nos. 1 and 2.)

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

(Synonymy in No. 1.)

♂ 619, 622, 628 (in al.), 640. ♀ 604, 620 (in al.). Asirgarh, Nimar.
♂ 673, 675. ♀ 680 .. .. .. Hewra, Nimar.
♂ 688 .. .. Sival, Nimar.
♂ 703, 712, 719. ♀ 704, 713 .. Chandgarh, Nimar.
♂ 739. ♀ 736, 740, 741, 764 .. Garoor, Nimar.

(*See* also Reports Nos. 1 and 2.)

MILLARDIA MELTADA.

The soft-furred Field Rat.

(Synonymy in No. 1.)

♂ 730, 748, 758, 766. ♀ 767. Garoor, Nimar.

(*See* also Reports Nos. 1 and 2.)

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

♂ 600. ♀ 598, 599 .. Asirgarh, Nimar.
♂ 681 (imm.) .. .. Hewra, Nimar.
♂ 684, 695 .. .. Sival, Nimar.
♀ 707 .. .. .. Chandgarh, Nimar.
♂ 726, 732, 746, 750, 753, 755. ♀ 727, 733, 749, 751, 752. Chandgarh, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

GUNOMYS KOK, Gray.

The Southern Mole-Rat.

(Synonymy in No. 1.)

♂ 629. ♀ 605, 606, 607 .. .. .. Asirgarh, Nimar.
♀ 671 .. .. Hewra, Nimar.
♂ 686, 687, 690 .. .. Sival, Nimar.
♂ 709. ♀ 710 .. .. Chandgarh, Nimar.
♂ 744, 757, 760. ♀ 745, 754, 761 .. Garoor, Nimar.

(*See* also Report No. 1.)

GOLUNDA ELLIOTI, Gray.

The Indian Bush-Rat.

(Synonymy in No. 1.)

♂ 608, 614, 615, 624. ♀ 613, 617, 630 (in al.) Asirgarh Nimar.
♂ 696 .. .. Sival, Nimar.
♂ 759. ♀ 763.. Garoor, Nimar.

(*See* also Reports Nos. 1, 2 and 3.)

LEPUS SIMCOXI, Wrought.

The Khandesh Hare.

(Synonymy in Report No. 1.)

♂ 708 .. .. Chandgarh, Nimar.
♂ 729, 737, 743. ♀ 742 .. Garoor, Nimar.

(*See* also Reports Nos. 1 and 2.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

XV.

(Continued from page 131 of this Volume.)

EUCOSMIDÆ.

Hermenias, n. g.

Antennæ in ♂ ciliated, with excavated notch in stalk near base. Palpi moderate, porrected, second joint with dense rough projecting scales above and beneath, terminal joint moderate. Thorax without crest. Forewings with 7 and 8 stalked, 7 to apex or termen. Hindwings with 3 and 4 stalked or coincident, 5 closely approximated at base, 6 and 7 closely approximated towards base.

Type *epidola*, Meyr. from Australia.

Hermenias pachnitis, n. sp.

♂ ♀. 14-15 mm. Head, palpi, and thorax blackish mixed with white. Antennal notch of ♂ at $\frac{1}{4}$. Forewings elongate, posteriorly slightly dilated, costa slightly arched, without fold, apex obtuse, termen slightly sinuate, rather oblique; 7 to termen; grey or dark grey ribbed with black; costa more or less obscurely strigulated with white irroration; an irregular patch of confused white marbling or strigulation occupying most of dorsal half from base to $\frac{2}{3}$ and thence extended as a fascia to costa before apex, including a more or less defined irregularly triangular spot of ground colour on middle of dorsum; a leaden-metallic whitish-edged erect mark from tornus, and a leaden-metallic streak along lower $\frac{3}{4}$ of termen: cilia grey sprinkled with whitish, basal half white with three or four blackish bars on upper half of termen. Hindwings with 3 and 4 coincident; thinly scaled, semi-transparent, dark grey: cilia dark grey, in ♂ on dorsum and tornus greatly elongated.

Maskeliya and Patipola, Ceylon (Pole, Green, Alston): in November, December, April and May, four specimens.

Hermenias implexa, n. sp.

♂ ♀. 14-16 mm. Head, palpi, and thorax rather dark fuscous, sometimes slightly whitish-sprinkled. Antennal notch of ♂ close above base. Forewings elongate, narrow, costa slightly arched, in ♂ with strong fold reaching from base to near middle, apex obtuse, termen indented-sinuate, rather oblique; 7 to termen; dark fuscous; a broad irregular streak of whitish irroration or suffusion along dorsum from base, occupying nearly half of wing, upper edge sinuate or angularly indented before middle,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

dorsal edge dotted with dark fuscous, separated from ocellus by a triangular tornal spot of ground colour; ocellus margined by two thick leaden-metallic streaks confluent beneath, sometimes whitish-irrorated, containing several irregular and variable black dots or short dashes; some oblique violet-leaden strigæ from costa posteriorly, rising from short obscure whitish strigulæ: cilia fuscous, with two or three series of white points. Hindwings with 3 and 4 coincident; grey, thinly scaled, veins dark fuscous, termen suffused with dark fuscous, more broadly towards apex; cilia light fuscous, with darker subbasal shade, tips whitish-tinged, in ♂ elongated on tornus and dorsum.

Namunakuli and Patipola, Ceylon (Green): from February to May, eight specimens.

Hermenias palmicola, n. sp.

♂ ♀. 11-12 mm. Head, palpi, and thorax fuscous. Antennal notch of ♂ close above base. Forewings elongate, narrow, somewhat contracted posteriorly, costa gently arched, in ♂ with strong fold reaching from base to beyond middle, apex obtuse, termen somewhat sinuate-indented beneath apex, rather oblique; 7 to termen; dark fuscous; dorsal half mostly covered with suffused transverse strigæ of whitish irroration; a pale leaden-grey erect striga from tornus, and a streak along termen; some oblique obscure purplish-leaden strigæ from costa posteriorly, rising from short strigulæ of whitish irroration; between these and terminal leaden streak is a narrow patch of fine scattered whitish hairscales; a small distinct white mark on costa before apex: cilia fuscous irrorated with whitish and somewhat sprinkled with dark fuscous. Hindwings with 3 and 4 coincident; thinly scaled, semitransparent, grey; veins dark fuscous; termen suffused with dark fuscous, more broadly towards apex; cilia fuscous sprinkled with whitish, in ♂ elongated on tornus and dorsum.

Trincomali, Puttalam, and Batticaloa, Ceylon (Green, Fletcher, Pole); in May, June and October, three specimens. Very like *impleva*, but smaller, without the defined triangular dark spot before tornus, and structurally distinct by the longer costal fold; it is a low-country species, whilst *impleva* occurs at high elevations only.

Spilonota, Steph.

This generic name supersedes *Tmetocera*, Led. and *Strepsicrates*, Meyr. I have described three Indian species, *S. rhothia*, which also occurs in Mauritius, *S. caleata* and *S. melanacta*, the antennal structure in the last-named having been overlooked; and now add four more.

Spilonota meleanocopa, n. sp.

♂ ♀. 15-17 mm. Head, palpi, and thorax dark grey sprinkled with white. Antennal notch of ♂ at $\frac{1}{3}$. Forewings elongate in ♂, rather narrow, costa slightly arched, in ♂ faintly sinuate beyond middle, with broad fold extending from base to beyond middle, apex obtuse, termen

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

straight, somewhat oblique; dark grey, coarsely and suffusedly strigulated with white; in ♂ a blackish patch on costa beyond middle; a black longitudinal mark in middle of disc, in ♀ slight and broken; a triangular blackish prætornal spot; ocellus margined by silvery-metallic streaks, and containing two or three black dots; a transverse black mark resting on middle of termen: cilia dark fuscous mixed and irrorated with whitish. Hindwings with 3 and 4 stalked; dark fuscous, thinly scaled, especially towards base, more so in ♂; cilia fuscous, towards tips whitish-sprinkled.

Khasis; in June, six specimens.

Spilonota algosa, n. sp.

♂ ♀. 12-15 mm. Head and thorax dull olive-greenish, mixed with dark fuscous or blackish. Palpi whitish-greenish, spotted or barred with blackish. Antennal notch of ♂ close above base. Forewings elongate posteriorly somewhat dilated, costa gently arched, without fold, apex obtuse, termen slightly sinuate, somewhat oblique; dull olive-green, with some iridescent-whitish scales and some scattered blackish strigulæ: costa black, with pairs of whitish strigulæ; basal patch strigulated with black, and with outer edge formed by a fascia of black suffusion, acutely angulated below middle; central fascia more or less irregularly suffused with black, acutely angulated in middle; two or three bluish-leaden-metallic oblique strigæ from costa posteriorly; a blackish prætornal spot, tending to be confluent with a blackish blotch before middle of termen, both limited posteriorly by blue-leaden-metallic streaks; apex black; a fine black terminal line: cilia olive-greenish mixed or obscurely barred with blackish. Hindwings with 3 and 4 stalked; thinly scaled, grey, with violet-blue iridescence: veins dark fuscous; cilia grey.

Khasis; in August and September, fourteen specimens.

Spilonota babylonica, n. sp.

♂. 15 mm. Head and thorax white, shoulders dark grey. Palpi grey, edges sprinkled with white. Antennal notch very near base. Forewings elongate, costa gently arched, without fold, apex obtuse, termen hardly sinuate, oblique; ochreous-white, base of scales pale greyish; costa and dorsum dotted with dark fuscous; a grey patch marked with dark fuscous extending along basal fourth of costa; a semioval grey blotch on middle of costa, reaching half across wing, marked with dark fuscous and discal edge suffused with black; a grey triangular prætornal spot; two or three black strigulæ on termen: cilia grey mixed with dark fuscous. Hindwings with 3 and 4 stalked; thinly clothed with blackish-grey scales, membrane with strong violet-blue iridescence; cilia grey-whitish, with greyer sub-basal shade, on dorsum long.

Nilgiris, 6,000 feet (Andrewes); in May, one specimen.

Spilonota aestuosa, n. sp.

♂. 17-21 mm. Head and thorax olive-greenish marked with dark

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fuscous. Palpi ochreous-whitish, second joint with apical bar and two spots dark fuscous. Antennal notch close above base. Forewings elongate, posteriorly slightly dilated, costa gently arched, with rather narrow fold extending from base to beyond middle, apex obtuse, termen sinuate, somewhat oblique; dull olive-greenish, mixed or strigulated with dark fuscous; a large blackish blotch extending along costa, from base to $\frac{3}{5}$, and reaching $\frac{3}{4}$ across wing, lower edge with a triangular emargination beneath middle of wing edged with white anteriorly, posterior edge rather oblique, with two acute projections, edged with leaden-metallic; a subtriangular black pretornal spot edged with leaden-metallic; costa posteriorly black with pairs of whitish strigulæ, giving rise to two oblique leaden-metallic strigæ and a blackish striga between them; a leaden-metallic streak close before termen in middle, preceded by a blotch of blackish suffusion: cilia olive-greenish, mixed with dark fuscous round apex and upper part of termen. Hindwings with 3 and 4 stalked; fuscous, veins and termen dark fuscous cilia fuscous.

Darjiling; Khasis; in May and August, two specimens.

Crusimetra, n. g.

Antennæ in ♂ minutely ciliated. Palpi moderate, porrected, second joint with rough projecting scales above and beneath, terminal joint short. Thorax with small posterior crest. Forewings with 7 and 8 stalked, 7 to termen. Hindwings with 3 and 4 connate, 5 approximated at base, 6 and 7 stalked.

Crusimetra verecunda, n. sp.

♂ ♀. 13-15 mm. Head, palpi, and thorax grey or dark grey, sprinkled with whitish. Forewings elongate, costa gently arched, in ♂ without fold, apex obtuse, termen sinuate, somewhat oblique; ochreous-brown or ferruginous-brown, variably irrorated or suffused (sometimes wholly) with dark grey whitish-tipped scales, apex and terminal area usually but not always remaining brown; a more or less marked spot of blackish irroration or suffusion towards dorsum before middle: cilia blackish, with some whitish points. Hindwings ochreous-grey-whitish or whitish-grey-ochreous, suffused with grey towards apex: cilia ochreous-whitish, with two grey shades.

Namunakuli, Ceylon (Green); in February, six specimens.

Acroclita, Led.

This name supersedes *Rhopobota*, Led. I have described one species, *A. physalodes*, which occurs in Ceylon and the Chagos Islands, and now record thirteen more, one of which is a well-known European species.

Acroclita clivosa, n. sp.

♂. 13-14 mm. Head white, sides of crown tinged with ochreous-brownish. Palpi fuscous, terminal joint and apex of second white. Thorax white suffused on sides with ochreous-brown, with two posterior blackish

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bars. Abdomen black at base beneath. Forewings elongate, costa gently arched, without fold, apex round-pointed, prominent, termen abruptly concave-indented beneath it, then somewhat obliquely rounded; 3 and 4 closely approximated throughout, 6 closely approximated to 7; grey suffusedly irrorated with white; costa dark fuscous, with pairs of whitish strigulæ; basal patch irregularly suffused with brown, more or less strigulated with blackish, on dorsum reaching to middle, outer edge obtusely angulated below middle; central fascia slender, ochreous-brown, not reaching dorsum, crossed in middle by a black streak extended almost to apex; some blue-leaden strigæ from costa posteriorly; ocellus enclosed by two leaden-metallic streaks: cilia grey irrorated with whitish, with dark fuscous apical patch. Hindwings with 3 and 4 stalked; pale grey-darker at apex: cilia pale grey, costal cilia thickened. Forewings on undersurface with rather broad suffused dark fuscous streak along costa from base to near apex.

Khasis; in October, two specimens.

Acroclita cheradota, n. sp.

♂ ♀. 10-11 mm. Head and thorax light ochreous. Palpi pale, ochreous, hairs beneath suffused with whitish. Forewings elongate, rather narrow, costa gently arched, in ♂ without fold, apex round-pointed, rather prominent, termen concave beneath it; light brownish-ochreous, with strong violet purple iridescence, irrorated with ferruginous-brownish except towards costa anteriorly; a blotch of irregular blackish strigulation extending on dorsum from near base to middle, and reaching more than half across wing; costa finely strigulated with blackish; an oblique suffused ferruginous-brown mark from costa beyond middle; some ferruginous-brown suffusion on costa towards apex, including a whitish strigula near apex, sometimes followed by a blackish dot, apical prominence margined beneath with whitish: cilia brownish-ochreous, beneath apex with a whitish bar. Hindwings with 3 and 4 stalked; grey, thinly scaled in disc, darker on veins and posteriorly; cilia grey.

Puttalam, Ceylon (Pole); Pusa (Lefroy); in March and April, two specimens. Larva feeding in rolled leaves of *Ficus religiosa (Lefroy)*.

Acroclita grypodes, n. sp.

♂. 17 mm. Head pale ochreous, face ochreous-whitish. Palpi greyish-ochreous, terminal joint and apex of second whitish. Thorax brownish, with whitish-ochreous dorsal stripe edged with dark fuscous. Forewings elongate, costa gently arched, without fold, apex falcate-prominent, termen semicircularly excavated beneath it; ochreous-brown; costal edge dark fuscous, with fine obscure oblique strigulæ of whitish irroration; a darker brown longitudinal band from base of dorsum to apex of wing, edged above with ochreous-whitish suffusion from before middle to near apex; dorsum dotted with blackish; a streak of whitish suffusion along dorsum from base

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to beyond middle, where it turns slightly upwards, edged above with a streak of dark fuscous suffusion which is continued beyond it along dorsum to beyond tornus; some ochreous-whitish irroration or suffusion posteriorly between this and median band: cilia fuscous somewhat sprinkled with ochreous-whitish, with patches of dark fuscous suffusion at apex and below middle of termen. Hindwings with 3 and 4 stalked; rather dark fuscous; cilia fuscous; on undersurface with a narrow elongate subcostal patch of blackish modified scales extending from $\frac{1}{4}$ to beyond middle.

Maskeliya, Ceylon (Pole); in May, one specimen.

Acroclita scleropa, n. sp.

♂ ♀. 15-16 mm. Head and thorax greyish more or less tinged with brown, thorax anteriorly suffused with blackish. Palpi dark fuscous. Forewings elongate, rather narrow, costa gently arched, in ♂ without fold, apex round-pointed, rather prominent, termen abruptly concave-indented beneath it; grey suffusedly irrorated with whitish; costa blackish, with pairs of fine whitish strigulæ; basal patch brownish, irregularly strigulated with blackish, reaching on dorsum to middle and suffused with blackish towards dorsum posteriorly, outer edge angulated in middle; central fascia narrow, oblique, upper half blackish, lower half ochreous-brownish, posterior edge with an abrupt black projection in middle; apical area ochreous-brown, with several oblique leaden-metallic strigæ from posterior half of costa, and a black elongate mark towards costa above ocellus; ocellus ochreous-brown, margined by two thick leaden-metallic streaks, and containing a black dash near lower extremity: cilia grey irrorated with whitish, with dark fuscous apical patch. Hindwings with 3 and 4 stalked; grey, veins darker; in ♂ beneath an elongate-ovate patch of blackish modified scales extending beneath costa from near base to $\frac{2}{3}$; cilia light fuscous, with darker subbasal shade.

Namunakuli, Patipola, and Maskeliya, Ceylon (Green, Pole, Alston); from January to April, five specimens.

Acroclita naevana, Hb.

Maskeliya, Ceylon (Pole); N. Coorg, 3,500 feet (Newcome); Khasis; in May, June, and from October to December, ten specimens. Occurs also throughout Europe and Central Asia to Japan. On the undersurface of both wings the colouring is darker in Indian examples than in European, so that the patch of black suffusion on the hindwings of ♂ stands out less conspicuously; otherwise I can detect no difference, and the specific identity is undoubted.

Acroclita symbolias, n. sp.

♂ ♀. 13-14 mm. Head white, sides fuscous. Palpi fuscous, terminal joint and apex of second white. Thorax brown, with pale grey central stripe. Forewings elongate, costa gently arched, apex round-pointed, prominent, termen abruptly concave-indented beneath it; pale greyish,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

faintly greenish-tinged; costa strigulated with dark fuscous; rounded-quadrate dark grey spots on costa representing edge of basal patch and extremity of central fascia, between these a white patch reaching half across wing; dorsal half of basal patch suffused with brown and dark fuscous, extending to beyond middle, outer edge angulated below middle; from its angle a streak of greenish-grey and brownish suffusion runs to apex, marked with two black dashes; ocellus brownish marked in middle with black, margined with thick leaden-grey marks becoming white above; a brown mark along middle of termen: cilia dark leaden-grey irrorated with white, towards base white. Hindwings with 3 and 4 stalked; grey, darker posteriorly; cilia grey.

Khasis; in August and October, two specimens.

Acroclita belinda, n. sp.

♂ ♀. 11-13 mm. Head white. Palpi dark grey, terminal joint and apex of second white. Thorax ochreous-whitish, anterior half blackish. Forewings elongate, rather narrow, costa slightly arched, without fold, apex round-pointed, termen sinuate, rather oblique; green mixed with iridescent-white; basal $\frac{2}{3}$ suffused with blackish except a broad dorsal pale ochreous streak with upper edge triangularly prominent beyond middle and terminated by a triangular blackish prætornal spot; costa posteriorly black, with four pairs of white strigulæ; two or three black dashes towards apex; ocellus margined laterally with iridescent-white: cilia blackish irrorated with whitish. Hindwings with 3 and 4 connate; grey; cilia light grey, sprinkled with whitish.

Khasis; in July and August, two specimens.

Acroclita esmeralda, n. sp.

♂ ♀. 9-10 mm. Head and thorax pale emerald-green, thorax spotted with black and white. Palpi white, spotted with black. Forewings elongate, rather narrow, costa gently arched, without fold, apex obtuse, termen sinuate, somewhat oblique; pale emerald-green strigulated with black; a black subquadrate spot on costa at $\frac{1}{3}$; a large irregular-edged triangular blackish blotch extending over dorsum from $\frac{1}{4}$ to tornus and reaching to middle of costa; costal area posteriorly blackish, with four pairs of whitish strigulæ giving rise to oblique leaden-metallic strigæ; ocellus emerald-green, edged with silvery-whitish, and crossed by three or four black dashes; a black terminal line: cilia pale greenish, round apex with black subbasal line, above apex blackish. Hindwings with 3 and 4 long-stalked; rather dark grey, thinly scaled in disc, veins and apical suffusion darker; cilia grey, tips paler.

Khasis; in October, two specimens.

Acroclita corinthia, n. sp.

♂ ♀. 13-15 mm. Head and thorax rather dark fuscous irrorated with pale ochreous. Palpi fuscous, obscurely spotted with whitish-ochreous

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

suffusion. Forewings elongate, posteriorly slightly dilated, costa gently arched, without fold, apex round-pointed, termen sinuate, somewhat oblique; fuscous, irrorated with whitish or whitish-ochreous, and strigulated with blackish; costa blackish, before middle with two, and beyond it with five pairs of whitish strigulæ, giving rise to more or less marked blue-leaden-metallic striæ, those from posterior half very oblique, and subcostal space between them more or less ferruginous; basal patch brownish strigulated with black, outer edge angulated below middle, little marked; central fascia slender, brown, strigulated with black, little defined; ocellus obscurely margined with blue-leaden metallic: cilia brownish sprinkled with whitish, variably marked with dark fuscous, especially at apex. Hindwings with 3 and 4 stalked; fuscous, very thinly scaled, semi-hyaline, with violet-purple reflections, in ♀ darker posteriorly; veins blackish; in ♂ on undersurface with a black patch along costa, from base to beyond middle, costal edge on this furnished with very long fine hairs; cilia grey, darker towards base.

Maskeliya, Ceylon (Pole, Green, Alston); Khasis; in May, and from October to December, five specimens. The characteristic hindwings distinguish this species.

Acroclita neaera, n. sp.

♂ ♀. 12-13 mm. Head grey-whitish. Palpi whitish, second joint mostly occupied by three dark fuscous spots. Thorax olive-greenish mixed with black and white. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, without fold, apex round-pointed, termen sinuate, somewhat oblique; dull olive-green suffusedly strigulated with white; markings margined and irregularly strigulated with black; basal patch represented by blotch at base and angulated fascia beyond it: central fascia moderate, oblique, interrupted below middle; costa posteriorly blackish, with four pairs of whitish strigulæ, giving rise to oblique purplish-leaden strigæ; ocellus margined laterally by purplish-leaden streaks mixed with whitish, and surmounted by a blackish spot: a black terminal line: cilia olive-greenish, outer half dark grey irrorated with whitish, round apex wholly blackish-irrorated. Hindwings with 3 and 4 stalked; dark grey, thinly scaled in disc; cilia rather dark grey. Forewings on undersurface in ♂ suffused with blackish on costal half from base to beyond middle.

Maskeliya, Ceylon (Pole); in May and June, two specimens.

Acroclita chlorissa, n. sp.

♂ ♀. 12-14 mm. Head and thorax green, shoulders suffused with blackish. Palpi green, obscurely spotted with blackish. Forewings elongate, posteriorly rather dilated, costa slightly arched, in ♂ with narrow fold extending from base to $\frac{2}{3}$, apex round-pointed, termen sinuate, somewhat oblique; green; markings obscurely edged with iridescent-whitish;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

triangular spots suffusedly outlined with black at base, on costa at $\frac{1}{4}$, and on dorsum at $\frac{1}{3}$; a blackish blotch on middle of costa, reaching half across wing, adjoining which beneath is a spot outlined with black; a small blackish spot on costa beyond this; a transverse blackish blotch from costa beyond $\frac{1}{2}$, reaching more than half across wing; a triangular spot on dorsum suffusedly outlined with black, sometimes almost touching this; a small black apical spot; a black terminal line: cilia green, with blackish apical spot. Hindwings with 3 and 4 very long-stalked; grey; cilia light grey, more whitish towards tips.

Khasis; in October, three specimens.

Acroclita multiplex, n. sp.

♀. 14-16 mm. Head white. Palpi dark fuscous, terminal joint and apex of second white. Thorax white mixed with light grey, shoulders spotted with dark fuscous. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex round-pointed, termen sinuate, somewhat oblique; white, with some transverse leaden-grey marks, especially towards dorsum; costa strigulated with blackish; a dark grey basal fascia marked with black; a dark grey black-edged spot on costa at $\frac{1}{4}$; a dark grey black edged blotch on dorsum at $\frac{1}{3}$, reaching half across wing; a slender oblique dark fuscous streak from middle of costa not reaching half across wing; a dark fuscous transverse blotch from dorsum before ocellus, marked with black and a brown spot, reaching more than half across wing; ocellus broadly margined with leaden-metallic, containing four short black marks adjacent to its posterior edge, separated with brownish, and surmounted by a semicircular blackish blotch; posterior half of costa with small blackish marks terminated beneath with ferruginous, alternating with strigulæ terminated with leaden-metallic; a leaden-metallic striga before apex; a black apical mark edged above with ferruginous-brown and beneath with white: cilia grey irrorated with white. Hindwings with 3 and 4 stalked; grey; cilia pale grey, with darker subbasal line.

Patipola and Ohiya, Ceylon (Pole, Green); in April and November, two specimens. Superficially extremely like *Eucosma cremnitis*, but smaller and apart from the differences in neuration, readily distinguished by the white head and apical portion of palpi.

Acroclita thysanota, n. p.

♂. 15-16 mm. Head and thorax dull olive-greenish, thorax somewhat strigulated with blackish. Palpi dull olive-greenish spotted with blackish. Abdomen with long whitish apical hairs. Forewings elongate, somewhat dilated posteriorly, costa gently arched, without fold, apex obtuse, termen straight, rather oblique; dull olive-greenish, strigulated with black except towards costa on posterior $\frac{2}{3}$; costal edge black with pairs of whitish strigulæ; a black spot on costa before $\frac{1}{3}$; a very oblique transverse black spot from middle of costa; posterior area of wing crossed by irregular

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

eaden-metallic strigæ, two of these enclosing a narrow ocellus marked with black, and preceded by a triangular blackish prætornal spot: cilia olive-greenish with some obscure dark fuscous and whitish bars, above apex blackish. Hindwings with 3 and 4 stalked; grey with prismatic-violet iridescence, thinly scaled; cilia whitish-grey, on dorsum and tornus much elongated to form a dense projecting pale ochreous hair pencil.

Khasis; in November, two specimens.

Ancylis carpalima, n. sp.

♂ ♀. 11-15 mm. Head whitish, more or less ochreous-tinged on crown. Palpi fuscous, terminal joint and long hairs of second white. Thorax brownish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex falcate, termen semi-circularly excavated beneath it: ferruginous-brownish or ferruginous-ochreous, variably mixed or obscurely streaked longitudinally with whitish; costa obliquely strigulated with blackish and whitish; dorsum dotted with dark fuscous; a more or less marked suffused whitish line along submedian fold, dorsal area within this sometimes suffused with dark brown; a more or less marked very oblique dark brown streak from middle of costa, costal area beyond this sometimes suffused with dark brown; a variably developed longitudinal patch of brown suffusion streaked with dark fuscous from middle of disc to near termen, and sometimes posterior area much suffused with dark brown; apical projection dark brown or ferruginous, edged anteriorly and beneath with white: cilia brown, variably sprinkled or largely suffused with white. Hindwings with 3 absent, tornus in ♂ rather prominent; rather dark grey, somewhat thinly scaled in disc; cilia grey or whitish-grey, round apex tinged with ochreous or fuscous.

Kandy, Ceylon (Green); N. Coorg, 3,500 feet (Newcome): Khasis; from August to November, ten specimens. Also occurs in Queensland, Australia. The markings are variable and confused; the dark brown colouring is more developed in specimens from Coorg and Ceylon than in those from the Khasis and Australia, but there is no constant difference.

Ancylis scatebrosa, n. sp.

♀. 13-14 mm. Head ochreous-whitish, forehead somewhat mixed with brownish. Palpi with long hairs, ochreous-whitish, second joint with spot of dark fuscous suffusion towards apex. Thorax ochreous-whitish marked with ferruginous-brown. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex falcate, termen concave; ochreous-whitish crossed throughout by irregularly anastomosing brownish-ochreous striæ, suffused with dark fuscous; posterior half of costa dark fuscous strigulated with white, subcostal space beneath this light ochreous, traversed by a very oblique leaden-metallic striga; a fine black terminal line: cilia light brownish-ochreous, with a blackish subbasal dot beneath apex, and more or less marked blackish subbasal shade on lower half of termen. Hindwing

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with 3 and 4 stalked; rather light grey; cilia whitish-grey, with darker subbasal shade.

Khasis; in June, two specimens.

Ancylis rostrifera, n. sp.

♂. 11-12 mm. Head rather dark fuscous. Palpi dark fuscous, terminal half white. Thorax fuscous mixed with white posteriorly, shoulders marked with blackish. Forewings elongate, costa rather strongly arched anteriorly, slightly sinuate posteriorly, apex falcate, termen strongly excavated beneath it; ochreous-white, dorsal half mixed with leaden-grey; costa anteriorly marked with small scattered blackish spots; lower half of basal patch formed by four irregular transverse blackish or dark fuscous marks; posterior area from beyond middle to near termen largely suffused with ferruginous-brown, somewnat mixed with blackish and posteriorly marked with leaden-metallic, its costal edge black strigulated with white, more strongly black posteriorly; terminal area white spotted with leaden-metallic, with a black terminal line, apex ferruginous-brown: cilia ochreous whitish. Hindwings with 3 and 4 stalked; grey, thinly scaled in disc; cilia grey, tips paler.

Maskeliya, Ceylon (Pole); in October, two specimens.

Ancylis ancorata, n. sp.

♀. 12-13 mm. Head pale brownish-ochreous, forehead mixed with blackish, face mixed with blackish and margined with whitish. Palpi with long hairs, whitish, spotted with blackish suffusion. Thorax brownish-ochreous. Forewings elongate, costa gently arched, apex falcate-prominent, termen abruptly concave beneath it; ochreous-brown, suffused with whitish-ochreous towards anterior half of costa; costa strigulated with black and on posterior half with whitish; a grey slightly brownish-tinged streak, edged above by a pale or whitish-tinged line, running along dorsum from $\frac{1}{3}$ to tornus and continued to middle of termen, dilated on tornus and termen, marked with some blackish suffusion before tornus; a triangular leaden-metallic mark before termen resting on extremity of this streak; sometimes a few black scales in disc towards middle; a leaden-metallic striga from $\frac{2}{3}$ of costa to near termen beneath apex; a white strigula on costa near apex, and a leaden-metallic terminal mark beneath it: cilia whitish-ochreous, above apex ochreous-brown, beneath it with spot of whitish suffusion. Hindwings with 3 and 4 stalked; grey, darker posteriorly; cilia grey.

Kegalle, Ceylon (Alston); Konkan (Young); three specimens.

Herpystis pallidula, n. sp.

♂ ♀. 10-14 mm. Head white. Palpi white, basal half infuscated. Thorax ochreous whitish. Forewings elongate, somewhat contracted posteriorly, costa gently arched, without fold, apex obtuse, termen slightly sinuate, rather oblique; ochreous-whitish or pale whitish-ochreous, with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

scattered strigulæ of dark fuscous irroration except toward base; costa obliquely strigulated throughout with black; an undefined spot of black irroration on fold indicating angle of basal patch; a narrow ochreous patch along posterior half of costa, marked with four pairs of whitish costal strigulæ and some very oblique leaden-metallic strigæ from these; ocellus obscurely margined with leaden-metallic, enclosing some scattered black scales: cilia whitish-ochreous. Hindwings pale greyish; cilia whitish-grey.

N. Coorg, 3,500 feet (Newcome); from October to December, six specimens.

Gypsonoma, Meyr.

This genus is essentially distinguished from *Eucosma* by the stalking of veins 6 and 7 of hindwings.

Gypsonoma anthracitis, n. sp.

♂ ♀. 10-11 mm. Head, palpi, and thorax in ♂ wholly dark grey, posterior extremity of thorax whitish; in ♀ head white, crown suffused with grey, dark fuscous on sides, palpi dark fuscous, with terminal joint and apex of second white, thorax dark grey mixed with white posteriorly, patagia white except shoulders. Abdomen in ♂ with long grey hairs from each side of back near base. Posterior tibiæ in ♂ clothed with rough whitish scales above. Forewings elongate, rather narrow, somewhat contracted posteriorly, costa gently arched, without fold, apex round-pointed, termen sinuate, rather strongly oblique; ochreous-white, somewhat sprinkled with grey; basal patch suffused with grey, with three or four blackish-grey striæ, outer edge very obtusely angulated below middle; central fascia and posterior area wholly suffused with grey, irregularly and sharply marked with black, costa finely strigulated with whitish, giving rise to some oblique leaden-metallic strigæ, ocellus leaden-grey edged with white: cilia whitish mixed with grey and dark fuscous (imperfect). Hindwings narrower than forewings, 3 and 4 stalked; dark grey, thinly scaled anteriorly; in ♂ a brush of long dense dark grey hairs from anterior half of costa; undersurface in ♂ with dorsal area broadly blackish, costal edge with rough projecting white scales anteriorly; cilia long, grey, in ♂ on dorsum forming an expanded rough fringe of very long hairs. Undersurface of forewings in ♂ suffused with dark grey towards costa, with ridge of projecting scales overhanging upper margin of cell.

Maskeliya, Ceylon (de Mowbray); in May, two specimens.

Eucosma, Hb.

The genera *Cydia* and *Notocelia* are now merged in this.

Eucosma celerata, n. sp.

♂. 9-10 mm. Head dark fuscous, back of crown and lower part of face suffused with whitish. Palpi dark fuscous, apical half white. Thorax white, shoulders with a dark fuscous spot. Forewings elongate, narrow,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

costa gently arched, apex round-pointed, prominent, termen concave, oblique; ochreous-white, with a few scattered dark grey strigulæ; costa strigulated with black; a semi-oval dark fuscous blotch extending along dorsum from near base to beyond middle, and reaching half across wing; a triangular dark fuscous blotch on costa beyond middle, not reaching half across wing; ocellus preceded and followed by some undefined leaden-grey suffusion; a blackish irregular mark above it; a triangular black apical spot extending into cilia, edged beneath with white: cilia ochreous-white. Hindwings with 3 absent; grey; cilia whitish-grey.

N. Coorg, 3,500 feet (Newcome); in May and December, three specimens.

Eucosma semicurva, n. sp.

♀. 15-16 mm. Head and thorax ochreous-white, thorax with a black posterior spot. Palpi blackish, terminal joint and upper part of second joint posteriorly white. Forewings elongate, costa gently arched, apex obtuse, termen slightly sinuate, somewhat oblique; ochreous-white, with a few scattered black strigulæ, costa with several small black spots or strigulæ; a semi-circularly curved black streak with extremities resting on costa near base and at $\frac{1}{4}$; a black spot on middle of costa; a black spot on dorsum near base, a rather larger one before middle, and a third rounded-triangular before tornus; a rather irregular slender black streak along upper part of termen: cilia blackish-grey on tornus with a whitish patch, beneath this black. Hindwings with 3 and 4 stalked; rather dark grey; cilia whitish-grey, with grey subbasal line.

Khasis; in June, two specimens.

Eucosma cremnitis, n. sp.

♂ ♀. 13-21mm. Head, palpi, and thorax grey or fuscous. Forewings elongate, slightly dilated posteriorly, costa gently arched, in ♂ with short fold not reaching $\frac{1}{4}$; apex round-pointed, termen sinuate, somewhat oblique: white, with some scattered grey strigulæ; costa strigulated with dark fuscous, a small dark fuscous spot on costa at $\frac{1}{4}$; a dark fuscous fascia extending from base of costa along dorsum to middle, posteriorly dilated into a blotch reaching half across wing and marked above with black: beyond this some grey suffusion, and then a dark fuscous transverse blotch before ocellus reaching more than half across wing and marked with black and a brown spot; ocellus edged with leaden-metallic, containing three black marks adjoining its posterior edge, and surmounted by a dark fuscous blotch suffused with black above; posterior half of costa with small dark fuscous marks terminated beneath with ferruginous-brown alternating with dark fuscous strigulæ terminated with leaden-metallic; a leaden-metallic striga before apex; a black apical mark edged above with ferruginous-brown and beneath with white: cilia grey with rows of white points, basal half suffusedly barred with whitish. Hindwings with 3 and 4 stalked; grey, veins dark fuscous; cilia grey.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Horton Plains and Maskeliya, Ceylon (Green, Pole, Fletcher); Palnis, 6,000 feet (Campbell); in August, and from March to May, twelve specimens.

Eucosma legitima, n. sp.

♂ ♀. 14-15 mm. Head white, sides of crown sometimes dark fuscous. Palpi dark fuscous, terminal joint and apex of second white. Thorax whitish, with blackish spots on shoulders and each side of back. Posterior tibiæ in ♂ with rough greyish hairs. Forewings elongate, somewhat dilated posteriorly, costa gently arched, without fold, apex obtuse, termen faintly sinuate, somewhat oblique; white or ochreous-white, with some scattered grey scales; upper half of basal patch dark grey marked with black; a subtriangular black blotch on dorsum before middle, and a smaller one before ocellus; ocellus yellow-ochreous, edged with leaden-metallic, and surmounted by a blackish blotch; posterior half of costa narrowly black with pairs of whitish strigulæ, space beneath this suffused with yellow-ochreous and crossed by oblique leaden-metallic strigæ; apex blackish: cilia ochreous-whitish, with a dark fuscous spot above apex and two on middle of termen. Hindwings with 3 and 4 stalked; rather dark grey; cilia grey.

Khasis; in April, and from August to November, six specimens.

Eucosma solidata, n. sp.

♂ ♀. 11-13 mm. Head rather dark fuscous, face in ♂ whitish. Palpi dark fuscous, terminal joint and apex of second white. Thorax grey mixed with blackish, suffused with black anteriorly. Forewings elongate, somewhat dilated posteriorly, costa gently arched, in ♂ without fold, apex round-pointed, termen sinuate, little oblique, more so in ♀; ochreous-whitish; basal patch leaden-grey marked with black, outer edge obtusely angulated below middle; a transverse series of blackish strigulæ beyond this, and two or three on costa; central fascia narrow, oblique, blackish or dark fuscous, tending to be interrupted below middle, preceded by some leaden-metallic marks, posterior edge with an abrupt black projection in middle; ocellus edged with leaden-metallic and containing four black dots; posterior half of costa black with four pairs of whitish strigulæ terminating in leaden-metallic marks, space between these brownish or fuscous; a spot of blackish suffusion above ocellus, tending to connect with middle of termen; apex blackish: cilia fuscous mixed with dark fuscous and sprinkled with whitish, towards tornus suffused with whitish. Hindwings with 3 and 4 stalked: fuscous, in ♀ darker; cilia whitish-grey, with grey subbasal line.

Khasis; in April and July, three specimens.

Eucosma calligrapha, n. sp.

♂ ♀. 17-19 mm. Head and thorax bronzy-ochreous mixed with dark fuscous. Palpi pale ochreous, terminal joint and three suffused spots of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

second joint dark fuscous. Forewings elongate, posteriorly dilated, costa gently arched, without fold, apex obtuse, termen faintly sinuate, vertical; light ochreous; costa on anterior half strigulated with blackish and whitish, on posterior half blackish with five white strigulæ with leaden-metallic tips; a leaden-metallic stria from costa beyond middle almost to termen beneath apex; basal ¾ of wing crossed by oblique leaden-metallic and black striæ not reaching costa; a triangular blackish prætornal spot; ocellus margined with leaden-metallic and crossed by several black bars, surmounted by some blackish suffusion; a blackish mark on middle of termen: cilia pale ochreous, with dark leaden-fuscous patches at apex and on middle of termen, and sometimes other bars. Hindwings with 3 and 4 connate; dark fuscous; cilia whitish-fuscous, with dark fuscous subbasal line.

Khasis; Dawna Hills, Burma (Annandale); from August to October, and in March, eight specimens. Allied to *isogramma* and *speculatrix*.

Eucosma melanoneura, n. sp.

♂ ♀. 13-15 mm. Head and thorax light greyish-ochreous, face and dorsal area of thorax in ♀ suffused with blackish. Palpi pale greyish; whitish towards apex and above. Forewings elongate, rather narrow, costa gently arched, without fold, apex obtuse, termen sinuate, little oblique; brownish, suffusedly irrorated with grey whitish-tipped scales; costa obscurely strigulated with blackish and whitish, on posterior half giving rise to some indistinct oblique leaden-greyish strigæ; some narrow dark fuscous suffusion along dorsum from base to near middle, and on a patch before tornus; ocellus edged with two obscure leaden-metallic streaks; a small ferruginous-brown apical spot. Cilia brownish with several suffused blackish lines and some whitish points, base whitish. Hindwings with 3 and 4 stalked; subhyaline, with violet-purple iridescence, apex and termen suffused with rather dark grey; veins in ♂ black, in ♀ dark fuscous; cilia pale bluish-grey, darker towards base. Undersurface of forewings in ♂ with blackish subcostal suffusion from base to beyond middle, and blackish streak along lower margin of cell.

Khasis; in October and November, two specimens.

Eucosma cyanopis, n. sp.

♂. 14-15 mm. Head light greyish-ochreous. Palpi ochreous-whitish, second joint spotted with dark grey suffusion. Thorax pale greyish-ochreous spotted with blackish. Forewings elongate, somewhat dilated posteriorly, costa gently arched, without fold, apex round-pointed, termen sinuate, somewhat oblique; pale ochreous irregularly mixed with grey and white; a large black patch overlaid with deep indigo-blue extending along costa from base to beyond middle and reaching to near dorsum, lower edge triangularly emarginate before middle of wing, posterior edge oblique-convex; costa posteriorly strigulated with black and white, giving rise to two or three oblique leaden-metallic strigæ; an irregular streak of blackish

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

suffusion running from lower angle of costal patch to apex; ocellus obscurely edged with leaden-metallic and marked with blackish; a black terminal line: cilia pale ochreous mixed with grey and sprinkled with whitish. Hindwings with 3 and 4 stalked; grey, thinly scaled, with violet reflections, veins and termen dark fuscous; cilia grey, tips whitish.

Khasis; in September and October, two specimens.

Eucosma ludicra, n. sp.

♂ ♀. 13-15 mm. Head, palpi, and thorax light yellow-ochreous. Forewings elongate, somewhat dilated, costa gently arched, without fold, apex obtuse, termen slightly sinuate, somewhat oblique; light yellow-ochreous, in and above cell suffused with ferruginous-brown, veins posteriorly marked with ferruginous-brown lines; costa indistinctly strigulated with ferruginous-brown, whitish-sprinkled on interspaces; some more or less developed dark fuscous strigulation about submedian fold from near base to before middle; a silvery-metallic transverse mark before median portion of termen preceded by three short blackish dashes; an oblique silvery-metallic mark before apex: cilia whitish-ochreous sprinkled with ferruginous-ochreous. Hindwings with 3 and 4 stalked; grey, in ♂ paler; cilia whitish, dorsum in ♂ clothed with long rough expanded blackish bristly hairs.

N. Coorg, 3,500 feet (Newcome); in November, four specimens.

Eucosma spicea, n. sp.

♂. 13 mm. Head and palpi whitish-ochreous, second joint of palpi with a faint fuscous spot. Thorax ochreous. Posterior tibiæ and basal joint of tarsi densely tufted with whitish hairs, posteriorly suffused with light greyish. Forewings elongate, moderate, posteriorly dilated, costa slightly arched, without fold, apex obtuse, termen rounded, somewhat oblique; pale ochreous; costa strigulated with blackish and whitish; a broad suffused ferruginous median streak from base to end of cell and thence to apex, sprinkled with blackish posteriorly, terminal area of wing suffused with light ferruginous; two or three oblique leaden-metallic strigæ from posterior half of costa; leaden-metallic marks on middle of termen and tornus; cilia whitish-yellowish, with ochreous subbasal line. Hindwings with rather contorted subdorsal fold, 3 and 4 stalked; dark grey, towards, base lighter and thinly scaled; cilia pale grey, with dark grey subbasal line.

Khasis; in June, one specimen.

Eucosma litigiosa, n. sp.

♂ ♀. 20-22 mm. Head and thorax grey mixed with dark fuscous and sprinkled with whitish. Palpi dark fuscous sprinkled with whitish. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa gently arched, without fold, apex obtuse, termen somewhat sinuate, little oblique; grey, irregularly mixed with white and strigulated with dark fuscous, sometimes partially suffused with brownish or light ochreous, especially tending to form a patch in disc beyond middle; costa spotted and strigulated with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

blackish; edge of basal patch irregularly marked with blackish, angulated below middle; central fascia represented by a dark fuscous spot on costa and a trapezoidal blackish blotch before tornus; a very irregular-edged black streak extending from disc at $\frac{3}{4}$ to apex; ocellus very obscurely edged with leaden-grey and whitish, and mixed with blackish: cilia grey irrorated with whitish, partially obscurely barred with dark fuscous. Hindwings with 3 and 4 connate: thinly scaled, semitransparent iridescent-grey; veins and termen dark fuscous; cilia whitish-grey, with grey subbasal shade.

Khasis; in June, September, and October, five specimens.

Eucosma numellata, n. sp.

♂ ♀. 11-13 mm. Head and thorax dark fuscous mixed with yellow-ochreous, face ochreous, lower part whitish. Palpi whitish-ochreous, spotted with dark fuscous suffusion. Forewings elongate, posteriorly dilated, costa gently arched, without fold, apex obtuse, termen slightly sinuate, somewhat oblique; blackish-fuscous, irregularly strewn with pale ochreous scales and strigulæ; two leaden-metallic striæ near base reaching from costa half across wing; two subconfluent pairs of leaden-metallic angulated striæ before middle, rising from pairs of white costal strigulæ; a third similar beyond middle, but not reaching dorsum; ocellus enclosed by two leaden-metallic streaks; a very oblique leaden-metallic striga from a white strigula on costa at $\frac{3}{5}$ to near termen beneath apex; three pairs of white costal strigulæ posteriorly, last giving rise to a short leaden-metallic striga: cilia whitish-ochreous, with dark leaden-grey subbasal line, on tornus suffused with grey. Hindwings with 3 and 4 connate; dark fuscous, lighter towards base: cilia pale fuscous, with darker subbasal line.

Khasis; in March and October, three specimens. Very like *speculatrix*, but termen of forewings less sinuate, and ♂ immediately distinguished by different colour of hindwings.

Eucosma lasiura, n. sp.

♂. 21-22 mm. Head and thorax dark fuscous. Palpi ascending, fuscous. Abdomen rather elongate, posterior half clothed with dense rough expansible lateral tufts of fuscous scales meeting above. Posterior tibiæ with rough projecting pale greyish-ochreous scales above and beneath. Forewings elongate, posteriorly dilated, costa gently arched, without fold, apex rounded-obtuse, termen rounded, little oblique; fuscous, strigulated and marbled with dark fuscous; costa spotted with dark fuscous, strigulated with fuscous-whitish between the spots; a quadrate dark fuscous spot beneath middle of disc; an ochreous-whitish discal dot at $\frac{3}{5}$, preceded by a spot of dark fuscous suffusion; cilia fuscous, with dark fuscous subbasal shade. Hindwings as broad as forewings, dorsal area folded over into a deep pocket and clothed with long rough hairs with a thickened glandular area, 3 and 4 connate; fuscous; cilia whitish-fuscous, with fuscous subbasal shade.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

N. Coorg, 3,500 feet (Newcome); in August, two specimens. Very similar superficially to *helota*, but distinguished by the sexual characters, especially the absence of the costal fold, which in *helota* is long; a third very similar species is *brachyptycha* (described from Australia, but occurring also in Ceylon) which has a short costal fold.

Lobesia genialis, n. sp.

♂. 12 mm. Head whitish-ochreous, face suffused with white, crown with two blackish spots. Palpi pale ochreous irrorated with dark fuscous, terminal joint, apex of second, and base white. Thorax ochreous mixed with whitish and transversely barred with blackish. Abdomen elongate, ochreous, anal segment with two black basal dots. Posterior tibiæ and basal joint of tarsi clothed with rough whitish scales above. Forewings elongate, narrow at base, posteriorly somewhat dilated, costa almost straight, with elongate glandular swelling beyond middle, apex obtuse, termen rounded, rather strongly oblique; light brownish-ochreous mixed with leaden-grey and white, with fine scattered black scales; basal patch irregularly marked with deeper ochreous and black, outer edge very obtusely angulated in middle; space between this and central fascia suffused with grey on dorsal half; central fascia ochreous-brown, direct, posterior edge with strong acute-triangular projection in middle, marked with a curved black streak along costal half; a small blackish spot on posterior portion of costal gland; a triangular dorsal spot between central fascia and tornus irrorated with dark grey and blackish; four pairs of whitish strigulæ on posterior half of costa, last giving rise to a circularly curved white line which cuts off a brown apical spot centred with blackish; a brownish blotch before middle of tornus, above convex and limited by a white line running to termen above middle, beneath undefined: cilia light ochreous suffused with whitish except round apex. Hindwings with termen deeply excavated so as to form an elongate narrow apical lobe or projection and broader rounded dorsal lobe; white, apical lobe rather dark grey; cilia whitish, round apex grey.

Peradeniya, Ceylon (Green); in January, one specimen.

Polychrosis cellifera, n. sp.

♂ ♀. 14-15 mm. Head, palpi, and thorax pale ochreous mixed with brownish and dark fuscous. Posterior tibiæ in ♂ clothed with whitish hairs above, basal joint of tarsi with long projecting brush of whitish hairs. Forewings suboblong, rather narrowed anteriorly, costa gently arched, apex obtuse, termen rounded, little oblique; pale ochreous mixed with brownish-ochreous and grey; basal patch strigulated with blackish, outer edge only defined by a small dark spot on costa and a slight angulated mark in disc; central fascia irregular, brown, reaching from costa ⅔ across wing, strongly marked with black from costa to near middle of wing; costa posteriorly dark fuscous with four pairs of grey-whitish strigulæ, beneath

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

this narrowly reddish-brown; a narrow grey and brown subterminal fascia marked with black dashes on veins, constricted or almost interrupted in middle; a short brown or grey streak marked with black along median portion of termen: cilia brownish or fuscous irrorated with whitish, with two dark fuscous lines becoming obsolete towards tornus. Hindwings in ♂ with subdorsal fold; fuscous, lighter anteriorly; cilia whitish-fuscous, with darker subbasal line.

Colombo, Ceylon (Mackwood); Pusa (Fletcher); in July, two specimens.

Statherotis decorata, Meyr.

♀. 19 mm. Head and thorax brown mixed with dark fuscous, lower half of face whitish, thoracic crest mixed with whitish. Abdomen dark fuscous. Forewings brown sprinkled with dark fuscous; an undefined basal patch strigulated with black; a semioval reddish-brown blotch extending along costa from $\frac{1}{3}$ almost to apex, on costal edge shortly strigulated with black, on lower edge margined anteriorly by a thick curved black streak from costa to beyond its middle, and posteriorly by an irregular black streak running from apex towards tornus $\frac{3}{4}$ across wing and dilated into a blotch in its central portion, the opening between these two streaks somewhat whitish-mixed; a short blackish streak along median portion of termen: cilia brown mixed with dark fuscous. Hindwings dark grey, cilia grey, with dark grey subbasal line.

Madulsima, Ceylon, in March (Green). This sex, which differs considerably in colouring from the ♂, has not been described before.

Argyroploce lamyra, Meyr.

Kegalle, Ceylon (Alston); one specimen. Described from Queensland, and not hitherto recorded elsewhere.

Argyroploce compsitis, n. sp.

♀. 13 mm. Head grey. Palpi grey, with a blackish band. Thorax grey, crest blackish. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, somewhat oblique; leaden-grey with faint purplish reflections; costa strigulated with black and whitish; two black dots near base, and one beneath costa at $\frac{1}{5}$; a triangular blackish white-edged blotch on dorsum at $\frac{1}{3}$, reaching more than half across wing: central fascia blackish on upper half, blackish-sprinkled but little marked on lower, white-edged on posterior margin, broadest in middle, beneath this suddenly narrowed and with a triangular slightly whitish-edged prominence downwards from anterior margin; an oblique transverse spot from costa at $\frac{2}{3}$, upper half blackish, lower half ferruginous-brown with two black bars; a blackish blotch before middle of termen, touching central fascia and termen, suffused beneath, convex and white-edged above; two small dark fuscous spots on costa posteriorly, terminated beneath with ferruginous-brown and a black dot; a small dark fuscous apical spot: cilia grey sprinkled with bluish-white, on upper half of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

termen obscurely barred with dark fuscous. Hindwings grey, thinly scaled anteriorly, broadly suffused with dark fuscous towards termen; cilia whitish-grey, with dark grey subbasal line.

Maskeliya, Ceylon (Alston); in November, one specimen.

Argyroploce scolopendrias, n. sp.

♂. 19 mm. Head, palpi, and thorax reddish-fuscous mixed with blackish. Posterior tibiæ without tufts. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex round-pointed, termen somewhat sinuate, rather oblique; crimson-fuscous, indistinctly striated longitudinally with blackish in disc, suffused with ochreous-whitish towards base in middle; costa strigulated with blackish and whitish; a slender black submedian streak from base to beyond middle, edged beneath with ochreous-brown suffusion; dorsal area beneath this forming a broad pale ochreous streak continued across tornus and as a broad terminal patch indistinctly lined with brownish to apex, where it is terminated by an oblique white mark; a white transverse linear mark on end of cell, and a black median streak from this to termen: cilia ochreous-whitish, with a reddish-fuscous bar at apex, and two on middle of termen. Hindwings with 3 and 4 stalked; light greyish-ochreous; cilia ochreous-whitish, with grey subbasal line.

Nilgiris, 6,000 feet (Andrewes); in May, one specimen. Very similar to *scorpiastis*, but forewings more elongate, termen more oblique, dorsal pale area forming a uniform band with straight black upper edge, hindwing paler.

Argyroploce scorpiastis, n. sp.

♂ ♀. 16-18 mm. Head and thorax fuscous, often reddish-tinged, sometimes mixed with dark fuscous. Palpi reddish-whitish barred with blackish suffusion. Posterior tibiæ without tufts. Forewings elongate, moderate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen slightly sinuate, little oblique; crimson-fuscous, lighter and more crimson-tinged towards costa; costa obliquely strigulated with dark reddish-fuscous and sometimes with whitish; basal $\frac{2}{5}$ longitudinally striated with ochreous-whitish in disc, mixed with black between striæ; a white transverse linear mark on end of cell, space between this and termen streaked longitudinally with ochreous whitish or brownish-ochreous, with a black median streak; a pale ochreous semioval patch extending along dorsum from $\frac{1}{4}$ to $\frac{3}{4}$, brownish-edged towards upper edge posteriorly, edged with whitish above; tornal area suffused with whitish-ochreous; dorsum and termen dotted with blackish: cilia whitish-ochreous, with a dark fuscous bar at apex and two in middle of termen. Hindwings with 3 and 4 stalked; fuscous; cilia ochreous-whitish, with fuscous subbasal line.

Khasis; in October and November, four specimens.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Argyroploce antaea, n. sp.

♂ ♀. 15-17 mm. Head fuscous, crown suffused with blackish, lower part of face whitish. Palpi whitish, second joint with a more or less marked black bar. Thorax whitish fuscous, with suffused dark fuscous dorsal stripe, crest blackish. Posterior tibiæ in ♂ with long ochreous-whitish scales towards apex above. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen slightly sinuate, vertical; brownish-ochreous, somewhat blackish-sprinkled, veins towards termen marked with blackish lines; costa black with pairs of white strigulæ giving rise to very oblique whitish strigæ crossing subcostal area only a whitish streak along submedian fold from base to $\frac{2}{3}$, and a patch of undefined whitish suffusion on tornus, tending to form streaks between veins; a streak of blackish suffusion along dorsum from base to middle: cilia whitish-ochreous, with fuscous bars at apex and in middle of termen. Hindwings with 3 and 4 stalked; rather dark fuscous; cilia fuscous-whitish, with fuscous subbasal line.

Kandy, Ceylon (Mackwood, Green); in February and from July to November, five specimens.

Argyroploce centritis, n. sp.

♂. 16 mm. Head and palpi reddish-fuscous. Thorax reddish-fuscous patagia paler, crest ferruginous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen straight, little oblique; brown; a black dot towards costa at $\frac{1}{4}$, and a few small scattered blackish dots in disc posteriorly; a streak of whitish irroration along dorsum from $\frac{1}{4}$ to tornus, anterior half of upper edge forming a triangular projection which reaches half across wing, and there is a second shorter projection beyond this, dorsal edge marked with a brown spot beneath first projection and a smaller one between the two: cilia brown, on tornus grey. Hindwings grey, thinly scaled, termen rather broadly suffused with dark fuscous; cilia whitish, with dark grey subbasal line.

Khasis; in November, one specimen. Allied to *caryactis*.

Argyroploce sandycota, n. sp.

♂. 12 mm. Head and thorax reddish-ochreous spotted with blackish. Palpi whitish-ochreous suffused with reddish-orange towards apex, with a blackish spot on base of second joint. Forewings elongate-triangular; costa gently arched, apex rounded-obtuse, termen rounded, little oblique; orange red, irregularly reticulated with dark fuscous; costa strigulated with black, interspaces posteriorly whitish; a blackish streak along dorsum from base to $\frac{2}{3}$ and a blackish spot on costa at $\frac{1}{4}$; a larger irregular blackish spot on costa beyond middle, and the reticulation coalesces into irregular markings in disc posteriorly and before tornus. Hindwings dark grey, thinly scaled anteriorly; cilia grey, with darker subbasal line.

Hakgala, Ceylon (Green); in April, one specimen.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Argyroploce iophaea, n. sp.

♂ ♀. 13-15 mm. Head white, crown tinged with grey. Palpi white, second joint with two faint grey or brownish spots. Thorax crimson grey mixed with white, thoracic crest large, dark crimson-brown. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen sinuate, little oblique; crimson-brown or deep crimson, often partially strewn with suffused whitish strigulæ, and marked with suffused iridescent-violet striæ: base narrowly whitish; a flattened-triangular patch of blackish suffusion extending along costa from near base to near apex, and reaching in middle half across wing, marked with oblique bluish-leaden-metallic strigæ rising from pairs of whitish costal strigulæ; some blackish and leaden-metallic suffusion towards dorsum, especially on anterior half and on tornus; a more or less marked whitish-ochreous streak along termen; a fine black terminal line: cilia whitish-ochreous, sometimes suffused with crimson on outer half, sometimes with a dark leaden-fuscous patch beneath tornus. Hindwings fuscous; cilia pale fuscous, with darker subbasal line.

Maskeliya, Ceylon (Pole, Alston); in May, June and November, four specimens.

Argyroploce microplaca, n. sp.

♂ ♀. 8-9 mm. Head, palpi, and thorax dark fuscous. Forewings elongate, narrow, costa slightly arched, apex round-pointed, termen sinuate, hardly oblique; blackish-fuscous, crossed by suffused blue-leaden-metallic striæ rising from oblique white costal strigulæ; a pale yellow-ochreous transverse patch reaching from termen close before tornus $\frac{3}{4}$ across wing, and touching an oblique apical wedge-shaped strigula of same colour: cilia pale yellow-ochreous. Hindwings grey; cilia light grey.

Khasis; in October and November, three specimens.

Argyroploce anemodes, n. sp.

♀. 12-13 mm. Head fuscous. Palpi iridescent-white, second joint with two spots of dark grey suffusion. Thorax blackish. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex, obtuse, termen almost straight, vertical; dark purple-fuscous suffused with blackish, finely sprinkled with minute ochreous points, a basal patch of leaden-metallic striation mixed with whitish, outer edge oblique and extended as a dorsal streak to ocellus; a blotch of leaden-grey markings mixed with white on costa before middle; three white costal strigulæ beyond this; two stronger white strigulæ enclosing apex; ocellus margined anteriorly by a double blue-leaden-metallic streak, and posteriorly by a blue-leaden-metallic whitish-edged spot cut by a blackish dash: cilia fuscous mixed with leaden-grey and dark fuscous, sometimes suffused with whitish-ochreous on tornus. Hindwings dark fuscous, more blackish posteriorly; cilia grey-whitish, with dark grey subbasal shade.

Kandy, Ceylon (Green); in June and August, two specimens.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Argyroploce pyrrhocrossa, n. sp.

♂ ♀. 15-16 mm. Head, palpi, and thorax light brownish finely sprinkled with fuscous or dark. Abdomen blackish-grey, in ♂ rather elongate. Forewings elongate, posteriorly slightly dilated, costa slightly arched, apex obtuse, termen sinuate, vertical; brownish, finely irrorated with whitish and dark fuscous; costal edge blackish strigulated with whitish; some undefined darker median suffusion from base to middle; a similar patch on tornus; two short oblique-leaden-metallic strigæ from costa posteriorly: cilia brown-reddish, at apex dark fuscous. Hindwings dark fuscous, more blackish posteriorly; cilia whitish-grey, with dark fuscous subbasal line.

Khasis; in March and November, three specimens. Specially characterised by the contrasted reddish cilia of forewings.

Pammene homotorna, n. sp.

♂ ♀. 11-13 mm. Head, thorax, and abdomen dark fuscous. Palpi ascending, pale whitish-ochreous. Forewings elongate-triangular, costa gently arched, apex rounded-obtuse, termen slightly rounded, rather oblique; 7 to apex; dark purplish-fuscous, sprinkled with blue-whitish points, costa with pairs of fine whitish strigulæ; anterior half of wing mostly covered by suffused curved leaden-metallic striæ; a thick curved blue-leaden-metallic striæ from $\frac{4}{5}$ of costa to tornus, lower portion with two short projections anteriorly; a subterminal series of black dots or short dashes strongest towards apex of wing: cilia whitish-fuscous, with dark fuscous basal and subapical shades, latter obsolete towards tornus. Hindwings with 3 and 4 stalked; dark fuscous, suffused with blackish posteriorly; cilia as in forewings.

Khasis; in June and September, six specimens.

Pammene theristis, n. sp.

♂ ♀. 11-14 mm. Head, thorax and abdomen dark fuscous. Palpi ascending, ochreous-whitish, in ♂ sprinkled with grey, in ♀ irrorated with dark fuscous. Forewings elongate, posteriorly dilated, costa slightly arched, apex obtuse, termen hardly sinuate, little oblique; 7 to termen; dark purplish-fuscous, slightly sprinkled with purple-whitish points; costa shortly strigulated with blackish; two sharply-marked ochreous white wedge-shaped costal strigulæ before apex; a blackish stria from costa at $\frac{2}{3}$ to termen above middle, in ♂ preceded and followed by blue-leaden-metallic strigæ: cilia rather dark purplish-fuscous, with blackish basal line. Hindwings with 3 and 4 stalked: dark fuscous, darker posteriorly; cilia fuscous-whitish, violet-iridescent, with dark fuscous basal line.

Maskeliya, Ceylon (Pole, de Mowbray); Kumaon; in May, June and October, four specimens. Bred from seedlings of *Shorea robusta* (Indian Forest Service).

Pammene peristictis, n. sp.

♂. 8-10 mm. Head, thorax and abdomen dark fuscous. Palpi rather

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

long, porrected, pale ochreous-yellowish, with a dark violet-fuscous oblique apical bar. Forewings subtriangular, costa posteriorly moderately arched; apex very obtuse, termen somewhat sinuate beneath apex, vertical; 7 to termen; dark purplish-fuscous, slightly sprinkled with whitish points, with some irregular indistinct broken darker transverse striæ; a nearly straight blackish stria from costa beyond middle to termen beneath apex; several blackish dots close before termen between this and tornus: cilia purplish-leaden-fuscous, with blackish basal line. Hindwings with 3 and 4 stalked; dark fuscous, basal half suffused with purple-blackish, termen somewhat paler-suffused; cilia fuscous. Undersurface of forewings with a blackish patch in middle of disc.

Maskeliya, Ceylon (Pole); in March, five specimens.

Laspeyresia prolopha, n. sp.

♂ ♀. 11-12 mm. Head and thorax grey with bluish iridescence, thorax obscurely barred transversely with darker. Palpi grey mixed with whitish, violet-iridescent. Abdomen dark fuscous, in ♂ ochreous-whitish beneath and on lateral patches before apex. Forewings suboblong, costa gently arched, bent in middle, with a projection of rough scales on bend, apex obtuse, termen slightly sinuate, vertical; dark purplish-fuscous, mostly overlaid with bluish-leaden-metallic suffusion, which covers most of basal and costal area anteriorly, a patch on middle of dorsum and two patches enclosing ocellus; two very oblique series of short black dashes crossing costal area posteriorly, with a blue leaden striga between them; some short whitish strigulæ on posterior half of costa, a pale ochreous dot in disc at $\frac{2}{3}$: cilia purplish-fuscous, with blackish subbasal line. Hindwings with 6 and 7 somewhat approximated towards base; dark fuscous, a suffused whitish-fuscous discal patch; cilia white, towards tornus violet-iridescent, with dark fuscous subbasal line. Undersurface of forewings with a whitish streak beneath cell; of hindwings with a whitish subdorsal streak, in ♂ surrounded with blackish suffusion, and a whitish patch in disc.

Khasis; in June and July, eight specimens.

Laspeyresia optica, n. sp.

♂. 16 mm. Head and thorax fuscous. Palpi fuscous suffusedly irrorated with whitish. Abdomen dark fuscous. Forewings elongate, moderate, posteriorly dilated, costa gently arched, apex obtuse, termen hardly sinuate, vertical; dark prismatic-fuscous, with strong green reflections, finely irrorated with pale ochreous-tinged points; costa very shortly and obscurely strigulated with blackish and whitish; three blue-metallic oblique strigæ from posterior half of costa, second short, beneath it an oblique series of two or three indistinct short blackish dashes; ocellus forming a bluish-leaden-metallic transverse patch, anterior angle touching first striga, its upper portion suffused with ground colour and finely striated longitudinally with blackish; a short distinct ochreous-white blue-tipped costal strigula before

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

apex: cilia purplish fuscous, round apex and upper half of termen lighter and bluish metallic, with blackish basal line. Hindwings with 6 and 7 rather approximately towards base; blackish; a suffused irregular whitish median band, not reaching margins, cut by blackish streaks on veins; cilia white with violet-blue iridescence, with dark fuscous basal line, round apex grey. Undersurface of forewings with white streak along lower margin of cell.

Khasis; in June, one specimen.

Laspeyresia pulverula, n. sp.

♂. 14 mm. Head and thorax dark fuscous irrorated with pale greyish-ochreous, face whitish-ochreous. Palpi whitish. Abdomen dark fuscous. Forewings elongate-triangular, costa slightly arched, apex obtuse, termen slightly rounded, somewhat oblique; dark purple-fuscous, anterior $\frac{2}{3}$ closely irrorated with ochreous-whitish, leaving an oblique dark fuscous mark crossing submedian fold before middle; costal area suffused with brown on posterior half, edge strigulated with whitish; a short oblique blackish striga from middle of costa and another from beneath costa at $\frac{3}{4}$ to above middle of termen, each followed by a purple-leaden-metallic striga; ocellus margined by ochreous-whitish irroration and very obscure leaden-metallic streaks: cilia grey, with black basal line. Hindwings with 6 and 7 approximated towards base; dark fuscous, with broad blackish terminal band; a suffused whitish spot in middle of disc; cilia white, with blackish basal line. Undersurface of forewings with streak of whitish suffusion along lower margin of cell; of hindwings with larger whitish discal patch.

Khasis; in June, one specimen.

Laspeyresia leucostoma, n. sp.

♂ ♀. 11-15 mm. Head dark fuscous, face white. Palpi white. Thorax grey, with a more or less developed blackish bar behind collar. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen straight, little oblique; purplish-fuscous suffused with blackish, with irregular broken violet-leaden-metallic striæ rising from pairs of whitish costal strigulæ; ocellus enclosed by two violet-leaden-metallic streaks, anterior duplicated, posterior followed by an irregular whitish-ochreous termina streak; upper half of ocellus suffused with whitish-ochreous; an irregular patch of whitish-ochreous suffusion above ocellus; two larger yellowish-white strigulæ at apex: cilia leaden-grey with a dark fuscous basal line finely edged with ochreous-white, more broadly at apex. Hindwings dark fuscous, thinly scaled on basal half; cilia iridescent-whitish with dark fuscous basal line.

Maskeliya, Ceylon (Alston); Palnis (Campbell); Khasis; from May to October, eight specimens.

Laspeyresia turifera, n. sp.

♂. 13 mm. Head yellow, sidetufts of crown dark fuscous. Palpi yellow, base brownish. Thorax and abdomen dark fuscous. Forewings

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

moderate, posteriorly dilated, costa slightly arched, apex obtuse, termen rounded, little oblique; dark brownish, strigulated with dark fuscous; a broad bright yellow transverse band extending from near base to middle posterior edge straight, vertical, rather irregular, costal edge strigulated with dark fuscous: cilia brownish with two dark fuscous shades. Hindwings with 6 and 7 approximated towards base: dark fuscous; cilia grey with dark fuscous basal line.

Khasis; in March, one specimen.

Laspeyresia primigena, n. sp.

♂. 11-13 mm. Head with appressed scales, blackish reticulated with whitish. Palpi transversely compressed, white, with black anterior streak. Thorax blackish transversely barred with whitish. Forewings rather elongate-triangular, costa gently arched, apex obtuse, termen rounded, somewhat oblique; bronzy-blackish; basal $\frac{2}{3}$ of wing sharply strigulated with whitish; a patch of about four incurved whitish striæ from middle of dorsum reaching $\frac{2}{3}$ across wing, apices tending to be broken up and connected into longitudinal striæ; several ochreous-white strigulæ from costa posteriorly, whence proceed some faint oblique strigæ of whitish irroration, and two or three short oblique shining blue-metallic strigæ; a shining blue-metallic dot in disc beyond middle; ocellus marked with two transverse ochreous-whitish streaks and enclosed by shining blue-metallic streaks, interior broken into spots; a short shining blue-metallic mark beneath apex: cilia rather dark purple-fuscous, with black basal line. Hindwings with 6 and 7 approximated towards base; blackish-fuscous; a thinly scaled fuscous-whitish elongate patch extending in disc from base to beyond middle; cilia white, with blackish basal line.

Khasis; in October and November, two specimens. The peculiar character of the palpi and head appears to show undoubted affinity to the *Glyphipterygidæ* marking this as an early type of the genus; but the neuration is as in typical forms of *Laspeyresia*.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA." SERIES IV, PART III.

By

Sir George F. Hampson, Bart., F.Z.S., F.E.S.

(*Continued from page 446 of this Volume.*)

Genus Monodes.

	Type.
Monodes, Guen. Noct., i., p. 240 (1852)	*nucicolora.*
Alpesa, Wlk., xv., 1662 (1856)	*villicosta.*

Proboscis fully developed; palpi upturned, rather slender, the 2nd joint reaching to vertex of head, the 3rd moderate; frons smooth; eyes large, round; antennæ of male typically ciliated; build slender; thorax chiefly clothed with scales, the pro and metathorax with typically slight spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with ochreous costal fascia and apical mark.

a. Forewing with the reniform with white annulus defined by black .. .. *conjugata.*

b. Forewing with the reniform almost obsolete .. *fissistigma.*

B. Forewing with the costal fascia grey, the apical mark ochreous .. .. *trifissa.*

2537. Monodes conjugata.

Hydrelia conjugata, Moore, P. Z. S. 1881, p. 369; Hmpsn., Cat. Lep. Phal. B. M., viii, p. 473, pl. 134, f. 9.

Eurois albicostata, Hmpsn., Moths Ind. ii, p. 228 (1894).

2049 *a.* Monodes fissistigma.

1777 *a.* Monodes trifissa.

Monodes trifissa, Hmpsn., Cat. Lep. Phal. B. M., viii, p. 475, pl. 134, f. 12, (1909).

♀. Head and thorax ochreous white tinged with rufous, the extremities of patagia with some black scales and the metathoracic crest blackish; pectus and legs suffused with fuscous brown; abdomen ochreous suffused with brown, the basal crest fuscous. Forewing with the base and costal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

area to just beyond postmedial line grey slightly irrorated with black, the inner area and a broad curved fascia from end of cell to apex ochreous, the cell and area beyond its lower extremity rufous and the medial part of terminal area grey with slight dark streaks on the veins and in interspaces; subbasal line represented by a slight oblique black striga from costa; antemedial line absent; orbicular white with an ochreous tinge in centre and slightly defined by brown at sides, narrow, very oblique, its lower extremity produced to three oblique white streaks with a bar across their extremities below the reniform which is represented by a very slight ochreous lunule; an oblique ochreous streak from below the orbicular to submedian fold at postmedial line, which is very indistinct and double from costa to vein 3, strongly bent outwards below costa, bent inwards at vein 3 and sinuous to inner margin; a terminal series of black points. Hindwing greyish wholly suffused with fuscous brown; the underside ochreous irrorated with fuscous, a blackish discoidal spot, curved waved postmedial line, and terminal series of striæ.

Habitat.—PUNJAB, Simla. *Exp.* 24 mill.

Genus NEOMILICHIA.

Type.

Neomilichia., Hmpsn., Cat. Lep. Phal. B. M., viii, p. 518 (1909) .. .. *hylea.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd moderate; frons with slight rounded prominence with corneous plate below it; eyes large, round; antennæ of male ciliated; build slender; head and thorax clothed chiefly with scales, the pro and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2048. NEOMILICHIA VEPRECOLA.

Genus PERIGEODES.

Type.

Perigeodes, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 287 (1908). *rectivitta.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately scaled in front, the 3rd rather long; frons smooth; eyes large, round; antennæ of male ciliated: head and thorax smoothly clothed with scales, the pro and metathorax with spreading crests, tibiæ moderately fringed with hair; abdomen with small dorsal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

crests on basal segments. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate, the cilia strongly dentate especially towards tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with large white patch on inner medial area extending almost to cell .. .. .. *poliomera.*

B. Forewing without white patch on inner medial area extending almost to cell.

a. Forewing with the lower part of reniform very large and extending to well below cell .. .. *tricycla.*

b. Forewing with the lower part of reniform moderate and extending to slightly below cell.

a^1. Forewing with bifid black spot beyond lower part of reniform.

a^2. Forewing yellow, the antemedial line almost obsolete, the stigmata defined by black points. *magna.*

b^2. Forewing ochreous suffused with rufus, the antemedial line double, the stigmata with pale annuli .. .. *malayica.*

b^1. Forewing without bifid black spot beyond lower part of reniform .. .. *rectivitta.*

2051. *b.* PERIGEODES POLIOMERA.

Perigeodes poliomera, Hmpsn., Cat. Lep. Phal. B. M., vii., p. 287., pl. 115. f. 11 (1908).

Head, tegulæ and patagia ochreous tinged with rufous, the tegulæ with darker edges; palpi black above, white below; frons with black bar; vertex of thorax, pectus and legs white, the forelegs tinged with brown, the tarsi fuscous ringed with white; abdomen white tinged with brown, the basal crest black at tip. Forewing ochreous tinged with rufous, the area below costa paler, becoming pure white at apex. A large white patch on inner area from near base to near tornus, rounded above, the terminal area redder to the oblique streak from termen just below apex, suffused with black towards tornus; the base white; traces of a double waved subbasal line from costa to submedian fold; a very indistinct double waved antimedial line, obsolete on the white area; orbicular and reniform with whitish annuli slightly defined by brown, the former with brown centre round the latter with its centre defined by black points, constricted at middle; a blackish patch beyond lower angle of cell; postmedial line double almost obsolete towards costa, strongly bent outwards below costa, then oblique, minutely waved and with series of black and white points on its

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

outer edge, bent outwards to inner margin at the extremity of the white patch, some slight pale points beyond it on costa; traces of a waved subterminal line; a terminal series of black points with white point before the point in submedian interspace; cilia reddish with series of black points at tips, wholly black towards tornus. Hindwing pale brown with terminal series of small dark lunules: cilia brownish white, the underside whitish, the costal area tinged with rufous, an indistinct diffused dark subterminal band from costa to vein 2, a terminal series of black points.

Habitat.—CENTRAL CHINA; HAINAN; ASSAM, Khasis. *Exp.* ♂ 32, ♀ 36 mill.

2051. a. PERIGEODES TRICYCLA.

Perigea tricycla, Guen., Noct 1. p. 226 (1852); Hmpsn. Cat. Lep. Phal. B. M. vii, p. 289, pl. 115, f. 12.

Bagada fuscostrigata, Beth. Baker, Nov. Zool. xiii, p. 209 (1906).

♂. Head and thorax pale ochreous mixed with dark brown and tinged with rufous; palpi with some dark brown at side of 2nd joint; antennæ brown; abdomen pale ochreous tinged with rufous, dorsally dark brown except at base. Forewing pale ochreous suffused with rufous and slightly irrorated with dark brown, the inner margin with fuscous brown fascia tinged with grey except at base, the postmedial area greyish brown except towards costa, terminated by the oblique dark brown streak from apex to the postmedial line at vein 5, diffused below; subbasal line represented by two black points below the cell; antemedial line very indistinct, double, rufous, minutely dentate, below vein 1 strongly bent inwards to inner margin; claviform represented by a dark striga at its extremity; orbicular pale, defined by brown except above, irregularly rounded; reniform pale, slightly defined by brown, strongly constricted at middle and figure-of-eight-shaped, extending well below the cell to vein 2, some dark points in its lower part, traces of an oblique line from it to inner margin; postmedial line indistinct, double, strongly bent outwards below costa, then minutely waved and oblique, some pale points beyond it on costa; subterminal line very indistinct, pale, defined on inner side by brown suffusion, slightly excurved below vein 7 at middle; a terminal series of dark points defined on inner side by pale lunules; cilia dark brown with a pale line at base. Hindwing dark brown with a reddish tinge; cilia with a pale line at base; the underside whitish tinged with brown, the terminal area suffused with brown, a brown postmedial line from costa to vein 5.

ab. 1, *fuscostrigata*—Hindwing on underside much more suffused with brown, a dark discoidal spot, the postmedial line entire.

Habitat—ASSAM, Khasis; BORNEO; BR. NEW GUINEA. *Exp.* 42-44 mill.

2051. PERIGEODES MAGNA.

2052. PERIGEODES MALAYICA.

Orthogonia malayica, Snell., Veth's Midden Sumatra Lep., p. 46, pl. 4, f. 6 (1892).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Xanthoptera nigridia, Hmpsn. Moths Ind., ii, p. 320 (1894).

2428. PERIGEODES RECTIVITTA.

Genus PERIGEA.

	Type.
Perigea, Guen. Noct., i., p. 225 (1852)..	*spicea.*
Condica, Wlk., ix., 239 (1856)..	*cupentia.*
Prospalta, Wlk., xiii., 1114 (1857)	*leucospila.*
Bagada, Wlk., xv., 1753 (1858)	*spicea.*
Gaphara, Wlk., Trans. Ent. Soc. (3) i., p. 96 (1862) ..	*tetera*
Myrtale, Druce, Biol. Centr. Am. Het. i., p. 443 (1891) ..	*imitata.*

Proboscis fully developed; palpi upturned, the 2nd joint typically reaching about to vertex of head and smoothly scaled, the 3rd typically rather long; frons smooth; eyes large, round; antennæ of male typically minutely ciliated; thorax smoothly clothed with scales, the prothorax with spreading crest, the metathorax with slight crest; tibiæ moderately fringed with hair; abdomen with slight dorsal crests on basal segments. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with a large part of wing occupied by grey or white patches .. .. *leprosa.*

B. Forewing with a large part of wing not occupied by grey or white patches.

a. Forewing cupreous black brown.

a[1]. Forewing with subterminal and terminal series of small white spots.

a[2]. Forewing with the orbicular white centre defined by white points .. .. .. *stellata.*

b[2]. Forewing with the orbicular not defined by white points.

a[3]. Forewing with the centre of the reniform broken up into white points .. .. *contigua.*

b[3]. Forewing with round white spot in centre of reniform with small brown lunule on it .. *leucospila.*

b[1]. Forewing without terminal series of small white spots.

a[2]. Forewing with the reniform broken up into white points .. .. *albomaculata.*

b[2]. Forewing with the reniform with slight white lunule on its inner edge .. .. .. *atricuprea.*

b. Forewing not cupreous black brown.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a^1. Forewing not yellowish with patches of rufous and brown suffusion in parts.

a^2. Forewing with the reniform defined on all sides by white points.

a^3. Hindwing white, the terminal area with dark suffusion, in female more suffused.. *dolerosa.*

b^3. Hindwing entirely suffused with brown in both sexes .. .. *galaxia.*

$b2$. Forewing with the reniform not defined on all sides by white points .. .. .. *capensis.*

$b1$. Forewing with the ground colour yellowish with patches of rufous and dark brown suffusion .. *spicea.*

2439*a*. PERIGEA LEPROSA.

1722*a*. PERIGEA STELLATA.

Prospalta stellata, Moore, Lep. Atk., p. 111 (1882); Hmpsn., Cat. Lep. Phal. B. M. vii., p. 314, pl. 115, f. 27.

Head rufous, the basal joint of antennæ with white point in front; thorax deep red brown, the base of tegulæ rufous, the vertex of thorax and tip of prothoracic crest white; tarsi with white points; abdomen brown, the basal crest white, the others black, the ventral surface rufous. Forewing cupreous brown suffused with black leaving the discal and submedian folds redder; five white points at base in and below cell, followed by an oblique white striga from costa with two white points below it; an antemedial series of white points on and below costa and on the veins, defined by black and with white streak before it on inner margin; orbicular represented by a small white spot surrounded by white points; reniform with four white points in centre surrounded by white points; traces of a waved dark medial line; postmedial line indistinct, dark, with white point at costa, strongly bent outwards below costa, then dentate and produced to white points on the veins, oblique below vein 4, some white points beyond it on costa; a subterminal series of small white spots on the veins, reduced to points on veins 4·3·2; another series of small white spots just before termen and a series of points on termen; cilia with series of white spots at tips and points at middle towards apex. Hindwing fuscous brown, the cilia white at tips; the underside pale red-brown, the terminal area suffused with fuscous, a faint discoidal lunule and diffused minutely crenulate postmedial line.

Habitat.—SIKHIM. *Exp.* 40 mill.

1722*b*. PERIGEA CONTIGUA.

Prospalta contigua, Leech, Trans. Ent. Soc. 1900, p. 122; Hmpsn., Cat. Lep. Phal. B. M. vii., p. 314, pl. 115, f. 28.

Head and thorax deep red-brown; basal joint of antennæ white; prothoracic crest with some white scales, the metathorax with white patch; tibiæ at base with white points, the tarsi ringed with white; abdomen

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

brown with the basal crest white. Forewing black-brown with a cupreous gloss; two white points at base; a subbasal white striga from costa and spot below cell with point in cell further from base; antemedial line represented by a white striga from costa, points on the veins and point on inner margin further from the base; claviform a small white spot; orbicular a small round white spot defined by black; reniform with three white marks in centre surrounded by small spots; traces of a waved dark medial line; postmedial line indistinct, dark, with white points at costa, strongly bent outwards below costa, then dentate and produced to white points on the veins, excurved to vein 4, then oblique, some white points beyond it on costa; a subterminal series of small white spots on the veins, somewhat excurved below costa and at middle; a terminal series of white points. Hindwing fuscous brown, the cilia whitish, brown at tips; the underside fuscous irrorated with white; a dark discoidal lunule and diffused minutely waved postmedial line.

Habitat.—W. China; Assam, Khasis. *Exp.* 30—42 mill.

1723. Perigea leucospila.

1722. Perigea albomaculata.

Mamestra albomaculata, Moore, P. Z. S. 1867, p. 52; Hmpsn. Cat., Lep. Phal. B. M. vii., p. 316, pl. 115, f. 31.

1722c. Perigea atricuprea.

Perigea atricuprea, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 316, pl. 115, f. 32 (1908).

Head and thorax black-brown with a few white scales; metathorax with white patch; tarsi slightly ringed with white; abdomen fuscous brown. Forewing glossy black-brown slightly irrorated with white; an indistinct waved whitish subbasal line from costa to submedian fold, with white point beyond it in cell; antemedial line black defined on inner side by whitish, somewhat waved and oblique; orbicular and reniform defined by black, the former round, the latter with white lunule on its outer edges and somewhat angled inwards on median nervure; faint traces of an oblique medial shade from lower angle of cell to inner margin; postmedial line black with white striga from costa, strongly bent outwards below costa, then dentate and produced to short streaks on the veins, incurved below vein 4, some white points beyond it on costa; traces of a waved dark subterminal line with waved white striga from costa, incurved below vein 3; a terminal series of white points; cilia with a slight waved white line through them. Hindwing greyish suffused with fuscous brown, a faint discoidal spot and sinuous postmedial line; a fine black terminal and some whitish on termen towards tornus; cilia with a slight whitish line through them; the underside fuscous brown irrorated with white, a brown discoidal lunule and diffused curved postmedial line.

Habitat.—Sikhim Tibet, Yatung. *Exp.* ♂ 34, ♀ 38 mill.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1721*a*. PERIGEA DOLEROSA.

Mamestra dolerosa, Wlk. XXXII. 667 (1865).

Hadena taprobanæ, Feld. Reis. Nov. pl. 110, f. 3 (1874).

Euplexia albomaculata, Semp. Schmett. Phil. p. 515, pl. 60. f. 2 (nec. Moore).

Head and thorax fuscous mixed with some ochreous; palpi black; the 2nd and 3rd joints white at tips; frons with black bars; tegulæ with black annuli; prothoracic crest tipped with ochreous, the metathorax with ochreous patch; pectus and legs ochreous white irrorated with brown; the tarsi black with pale tinge; abdomen ochreous suffused with fuscous brown. Forewing fuscous; subbasal line represented by ochreous striæ from costa and cell; some ochreous and black scales on inner margin before the antemedial line, which is indistinct, waved, black, interrupted, defined on inner side by ochreous striæ at costa and inner margin and ochreous point at submedian fold; orbicular with incomplete whitish annulus defined by black, small, irregularly elliptical; reniform with irregular white lunule in centre surrounded by ochreous points defined by black, constricted at middle; postmedial line with white spot at costa, strongly bent outwards below costa, then defined by slight ochreous lunules on outer side, dentate and produced to black and white points on the veins, oblique below vein 4, some white points beyond it on costa; subterminal line represented by a series of ochreous white points defined on inner side by small dentate black marks, excurved below vein 7 and at middle; a series of minute white points just before termen; cilia fuscous with series of ochreous white points at base. Hindwing white tinged with brown, the veins and terminal area suffused with fuscous brown, a terminal series of black striæ defined by whitish on inner side; cilia ochreous white, with a slight brown line through them on apical half; the underside white, the costal area tinged with ochreous and irrorated with fuscous, a discoidal point, slight diffused waved postmedial line from costa to vein 2, and diffused subterminal band.

Habitat.—C. CHINA; BOMBAY; MADRAS, Nilgiris; CEYLON, Kandy; PHILIPPINES, Manila; FIJI. *Exp.* 36-40 mill.

Larva, Brown. Food plant, *Conyza balsamifera*.

1721*b*. PERIGEA GALAXIA.

Perigea galaxia, Butl., P. Z. S. 1883, p. 159; Hmpsn. Cat. Lep. Phal. B. M. vii, p. 324, pl. 116, f. 9.

Head and thorax fuscous brown mixed with grey-white; tarsi black ringed with white; abdomen grey suffused with fuscous. Forewing grey suffused with fuscous and irrorated with white; subbasal line represented by a white striga from costa; antemedial line black, defined on inner side by white towards costa, waved, somewhat oblique; orbicular white defined by black, small, round; reniform a white lunule with some black points on

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

it, its upper and lower extremities surrounded by white points; a diffused medial line, excurved at middle; postmedial line black, with white bar at costa, bent outwards below costa, then dentate and produced to black and white points on the veins, incurved below vein 4, some white points beyond it on costa; subterminal line defined by diffused fuscous on inner side, angled outwards at vein 7 and excurved at middle; a terminal series of black points; cilia with a series of white points at base. Hindwing grey-brown with a fuscous tinge; cilia whitish at tips; the underside white irrorated with fuscous, a discoidal lunule filled in with white, bisinuate postmedial line, and traces of diffused subterminal band.

Habitat.—PUNJAB, Kulu, Sultanpur, Simla, Dharmsala. *Exp.* 30-38 mill.

1721. PERIGEA CAPENSIS.

Apamea capensis, Guen. Noct. 1, p. 213 (1852); Hmpsn. Cat. Lep. Phal. B. M. vii, p. 332, pl. 116, f. 20.

Perigea apameoides, Guen. Noct. 1, p. 229 (part).

Caradrina conducta, Wlk., X, 296 (1856).

Celæna serva, Wlk. XV., 1689 (1858).

Hadena pauperata, Wlk., XV, 1727 (1858).

Mamestra prodita, Wlk., Journ. Linn. Soc. Zool. vi. p. 185 (1862).

Perigea inexacta, Wlk., XXXII, 682 (1865).

„ *canorufa*, Wlk., XXXII, 683 (1865).

„ *illecta*, Wlk., XXXII, 684 (1865).

Hadena leonina, Wlk., XXXIII, 735 (1865).

„ *spargens*, Wlk., XXXIII, 739 (1865).

„ *funesta*, Wlk., XXXIII, 740 (1865).

Perigea centralis, Moore, Lep. Ceyl. iii, p. 28, pl. 147 f. 2 (nec. Wlk.).

„ *meleagris*. Saalm. Lep. Madag., p. 271, f. 228 (1891).

2050. PERIGEA SPICEA.

Perigea spicea, Guen. Noct. 1, p. 226 (1852); Hmpsn. Cat. Lep. Phal. B. M. vii, p. 348.

Bagada pyrochroma, Wlk., xv. 1753 (1858), Hmpsn. Ill. Het. B.M. ix, p. 97, pl. 162, f. 2.

Acontia firina, Swinh., P. Z. S. 1885, p. 455, pl. 27 f. 5.

Genus HADJINA.

Type.

Hadjina, Staud., Iris., iv, p. 286 (1891).. .. .. *lutosa.*

Proboscis fully developed; palpi upturned, the 2nd joint slender, reaching to vertex of head and moderately fringed with hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male typically ciliated; build slender; head and thorax clothed almost entirely with scales, the pro and meta-thorax with spreading crests; legs moderately fringe

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with hair; abdomen with dorsal crest at base only. Forewing rather short and broad, the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from well below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the medial line indistinct or absent.
- *a.* Forewing not suffused with fiery red.
  - a^1. Hindwing wholly tinged with brown.
    - a^2. Hindwing not ochreous.
      - a^3. Forewing with the inner area cupreous red .. *cupreipennis.*
      - b^3. Forewing with the inner area not cupreous red.
        - a^4. Forewing purplish red-brown .. .. *chinensis.*
        - b^4. Forewing fuscous brown .. .. *cinerea.*
    - b^2. Hindwing ochreous tinged with brown .. *modestissima.*
  - b^1. Hindwing white, the terminal area suffused with brown.
    - a^2. Forewing with the subterminal line excurved at middle .. .. *viscosa.*
    - b^2. Forewing with the subterminal line not excurved at middle .. .. *poliastis.*
- *b.* Forewing suffused with fiery red .. .. .. *pyroxantha.*

B. Forewing with prominent rather diffused dark medial line .. .. *grisea.*

1834 *b.* HADJINA CUPREIPENNIS.

Hattia cupreipennis, Moore, Lep. Atk. p. 112 (1882); Hmpsn. Cat. Lep. Phal. B. M. viii, p. 525, pl. 136, f. 13.

Head and thorax fiery red mixed with dark brown and some grey; abdomen dark brown. Forewing deep cupreous red shading to brown mixed with grey on costal and terminal areas: subbasal line represented by a slight dark striga from costa; antemedial line very indistinct, waved; claviform absent; orbicular and reniform whitish irrorated with brown and very faintly defined by brown, the former round, the latter somewhat quadrate; postmedial line very indistinct, dark, bent outwards below costa, then produced to dark streaks with grey points on them on the veins, incurved below vein 4; hardly a trace of the subterminal line; a fine punctiform black terminal line. Hindwing glossy yellowish brown: a fine dark terminal line and slight pale line at base of cilia; the underside pale tinged with red and thickly irrorated with brown, a small black discoidal lunule and traces of a curved postmedial line.

Habitat.—PUNJAB, Murree; SIKHIM. *Exp.* 30-36 mill.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1833 *b*. HADJINA CHINENSIS.

Perigea chinensis, Wllgrn. Wien. Ent. Mon, iv, p. 169 (1860).

Segetia mandarina, Staud. Rom. Mem. vi, p. 482, pl. ix, f. 4 (1892); id. Cat. Lep. pal. p. 170.

,, *sareptæ*, Grœs.Bul. Ent. Zeit. XXXII,p. 350(1888)nec.Guen.

Amyna pulverea, Leech, Trans. Ent. Soc. 1900, p. 114.

1834c. HADJINA CINEREA.

Hadjina cinerea, Hmpsn., Cat. Lep. Phal. B. M. viii., p. 526, pl. 136, f. 15 (1909).

♂. Head and teguke pale fulvous; thorax dark brown mixed with grey and a few black scales; tarsi with pale rings; abdomen grey-brown, the anal tuft ochreous. Forewing dark brown suffused with grey and irrorated with black; subbasal line represented by a slight grey striga from costa; antemedial line very ill-defined, grey, diffused, waved; claviform absent; orbicular and reniform grey irrorated with black, undefined, the former round, the latter somewhat constricted at middle; postmedial line very ill-defined, grey, diffused, bent outwards below costa and oblique below vein 4; subterminal line very indistinct, grey faintly defined by blackish on inner side, excurved below vein 7 and at middle; a terminal series of slight black points. Hindwing silky fuscous grey, the cilia slightly paler; the underside with faint black discoidal spot and traces of postmedial line.

Habitat—SIKHIM, 1,800′. *Exp.* 26 mill.

1880. HADJINA MODESTISIMA.

Apamea modestissima, Snell., Tijd. V. Ent. xx, p. 26, pl. 2, f. 14 (1877).

Hipœpa opacaria, Swinh., Trans. Ent. Soc., 1890, p. 264, pl. 8, f. 3.

1834*d*. HADJINA VISCOSA.

Mythimna viscosa, Frr. Neue. Beitr. i., p. 39, pl. 21, f. 3, (Aug. 1831) Staud. Cat. Lep. pal., p. 170.

,, *implexa*, Treit. Schmett. Eur. x., 2, p. 73 (1835); nec. Hübn. Dup. Lep. Fr. Suppl. iv., p. 98, pl. 58, f. 7.

Head and thorax red-brown mixed with grey scales; tarsi fuscous with pale rings; abdomen ochreous. Forewing red-brown slightly irrorated with greyish ochreous; subbasal line absent; antemedial line hardly traceable, greyish, waved; claviform absent; orbicular and reniform small with faint grey annuli, undefined, the former oblique elliptical, the latter constricted at middle; postmedial line very indistinct, slightly defined by grey on outer side and with prominent grey striga from costa, bent outwards below costa and oblique below vein 4, some pale points beyond it on costa; subterminal line very indistinct, pale, angled outwards at vein 7 and slightly excurved at middle; a terminal series of blackish points; cilia with a fine pale line at base. Hindwing white, the termen tinged

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with pale red-brown from apex to submedian fold, in female almost entirely suffused with brown; the underside with the costal area irrorated with red.

ab. 1.—Much more ochreous or grey irrorated with fuscous and with hardly a trace of rufous; forewing with the ante and post-medial lines more distinct, the former angled outwards in submedian fold and above inner margin and inwards on vein 1, a dark patch sometimes present between orbicular and reniform.

Habitat.—SPAIN; SICILY; CANARIES; SYRIA; PERSIAN GULF; SIND, Karachi 82. *Exp.* 28·34 mill.

1833*c*. HADJINA POLIASTIS.

1795*a*. HADJINA PYROXANTHA.

2053. HADJINA GRISEA.

Genus CATAMECIA.

	Type.
Catamecia, Staud. Iris. x., p. 288 (1897)	*jordana.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about middle of frons and moderately scaled, the 3rd short; frons with truncate conical prominence with slight raised edges and corneous plate below it; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with scales, the pro and meta-thorax with spreading crests; tibiæ slightly fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rectangular, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male serrate.

1871. CATAMECIA FURTIVA.

Sect. II.—Antennæ of male ciliated.

1830. CATAMECIA MINIMA.

Apamea minima, Swinh., P. Z. S., 1889, p. 410; Hmpsn., Cat. Lep. Phal. B. M., viii. p. 543, pl. 136, f. 29.

Catamecia bacheri, Staud. Cat. Lep. pal., p. 213 (1901).

Genus NAMANGANA.

	Type.
Namangana, Staud. Stett., Ent. Zeit. 1888, p. 28 ..	*cretacea.*
Eupolia, Smith, Trans. Am. Ent. Soc., xxi., p. 69 (1894)..	*licentiosa.*

Proboscis fully developed, palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled in front, the 3rd typically short; frons smooth; eyes large, round; antennæ of male typically ciliated; head and thorax clothed chiefly with scales, the pro and meta-thorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

crest at base only. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole: 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars: 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I. (*Eupolia*).—Antennæ of male bipectinate with long branches.

2054*a*. NAMANGANA PECTINICORNIS.

Sect. II. (*Namangana*).—Antennæ of male ciliated.

A. Forewing with elongate V-shaped black marks on terminal area between veins 7 and 3 .. .. *cashmirensis*.

B. Forewing without V- shaped black marked on terminal area .. .. *atrescens*.

1942. NAMANGANA CASHMIRENSIS.

1858*a*. NAMANGANA ATRESCENS.

Genus CINGALESA.

	Type.
Cingalesa, Hmpsn., Moths Ind., ii., p. 336 (1894) ..	*strigicosta*.

2108. CINGALESA STRIGICOSTA.

Genus LOPHOTYNA.

	Type.
Lophotyna, Hmpsn., Cat. Lep. Phal. B. M., ix, p. 19 (1910).	*albirena*.

Proboscis fully developed; palpi oblique, fringed with long hair in front, the 3rd joint short, porrect; frons smooth with large tuft of hair; vertex of head crested; eyes large, round; antennæ of male ciliated; head and thorax clothed almost entirely with scales, the tegulæ produced to a slight dorsal ridge, the pro-thorax with high triangular crest, the meta-thorax with spreading crest: tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex produced and acute, the termen strongly crenulate and obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with the termen waved: veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellullars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1724. LOPHOTYNA ALBIRENA.

Genus GORTYNA.

	Type.
Gortyna, Treit. Schmett. Eur. v (2) p. 330 (1825)	*leucostigma*.
Helotropha, Led. Noct. Eur. p. 118 (1857)	*leucostigma*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male typically ciliated; head and thorax clothed chiefly with scales, the pro and meta-thorax with spreading crests

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rectangular, the termen crenulate: veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·9 from upper angle; 8 anastomosing with the cell near base only.

1795. GORTYNA LEUCOSTIGMA.

Noctua leucostigma, Hübn., Eur. Schmett. Noct. f. 375 (1808); Staud. Cat. Lep. pal, p. 186.

Noctua fibrosa, Hübn., Eur. Schmett. Noct. f. 385 (1808) Dup. Lep. Fr. vii 1, p. 132, pl. 109 f. 4; Steph. Ill. Brit. Ent. Haust. iii, p. 7.

,, *lunina*, Haw., Lep. Brit. p. 209 (1809).

Cerastis lævis. Butl., Trans. Ent. Soc. 1881, p. 181.

Hydræcia khasiana, Moore, P. Z. S., 1881, p. 342, pl. 37, f. 5.

Genus HYDRÆCIA.

	Type.
Gortyna, Ochs. Schmett. Eur. iv., p. 82 (1816) non descr.; Hübn. Verz., p. 232 (1827), nec. Treit. 1825 ..	*micacea.*
Hydræcia, Dup. Cat. Meth., p. 114 (1844)	*micacea.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and fringed with long hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male typically minutely serrate; thorax clothed with hair and hair-like scales, the tegulæ produced to a slight dorsal ridge, the prothorax with sharp triangular crest, the metathorax with spreading crest; tibiæ moderately fringed with hair; abdomen with some rough hair at base, dorsal crest on first segment and lateral fringes of hair. Forewing with the apex somewhat produced and acute, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1594. HYDRÆCIA BASALIPUNCTATA.

Genus PYRRHIA.

	Type.
Pyrrhia, Hübn. Verz., p. 233 (1827)	*purpurina.*

1598. PYRRHIA UMBRA.

Noctua umbra, Hüfn. Berl. Mag. iii., p. 294 (1767); Smith, Cat. Noct. N. Am., p. 216; Staud. Cat. Lep. pal. p. 224.

,, *marginata*, Fabr. Syst. Ent., p. 610 (1775); Dup. Lep. Fr. vii. pl. 119, f. 8; Steph. Ill. Brit. Ent. Haust. iii., p. 108.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Noctua rutilago, Schiff, Wien. Verz. p. 88 (1776); Hübn. Eur. Schmett, Noct. f. 185.

,, *umbrago*, Esp. Schmett, iv., pl. 185, ff. 6-7 (1796).

,, *conspicua*, Borkh. Eur. Schmett, iv., p. 50 (1792).

,, *marginago*, Haw. Lep. Brit., p. 217 (1809).

Heliothis cilisca, Guen, Noct. ii., p. 179 (1852).

,, *exprimens*, Wlk. xi., 687 (1857); Grote, Bull. Buff. Soc. Nat. Sci. ii., p. 35, pl. iii., f. 5.

Pyrrhia angulata, Grote, Trans. Am. Ent. Soc. v., p. 93 (1874); id. Bull. Buff. Soc. Nat. Sci. ii., pl. 3, f. 6.

Hydræcia tibetana, Moore, A. M. N. H. ( ) p. 232 (1878); id. 2nd Yarkand Mission Lep., p. 9, pl. i., f. 21.

Chariclea verilliger, Christ, Iris., vi., p. 92 (1893); Staud. Cat. Lep. pal., p. 223.

Pyrrhia aconiti, Holtz., Allg. Zeitschr. Ent. vii., p. 212 (1902).

Genus CALLŒCIA. *Type.*

Callœcia, Hmpsn., Cat. Lep. Phal. B. M. ix., p. 56 (1910) .. *svinhœi.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching to about middle of frons and moderately fringed with hair, the 3rd short; frons with large corneous prominence with raised edges, the lower edge produced to a plate grooved in front, a corneous plate below it; eyes large, round; antennæ of male laminate and almost simple; thorax clothed with hair and scales mixed, the pro and meta-thorax with spreading crests; tibiæ moderately fringed with hair; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and slightly crenulate: veins 3 and 5 from near angle of cell: 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from well below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2025. CALLŒCIA SVINHŒI.

Genus CYTOCANIS. *Type.*

Cytocanis, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 110 (1910). *denticulosa.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to middle of frons and moderately fringed with scales in front, the 3rd moderate; frons with large corneous prominence with raised edges, its lower edge produced to a beak-like process; eyes large, round; antennæ of male laminate and almost simple; thorax clothed almost entirely with scales and without crests; tibiæ smoothly scaled, the joints of fore tarsi rather short and the fungues rather large; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from well below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2016. CYTOCANIS DENTICULOSA.

Genus ELYDNA.	Type.
Elydna, Wlk. xv., 1712 (1858)	*transversa*.
Dyrzela, Wlk., xv., 1758 (1858)	*plagiata*.
Dadica, Moore, P. Z. S. 1881, p. 349	*lineosa*.
Radinacra, Butl., A. M. N. H. (5) i., p. 161 (1878) ..	*cinerascens*.
Leucocosmia, Butl., Trans. Ent. Soc., 1886, p. 394 ..	*reclusa*.
Floccifera, Hmpsn., Moths. Ind. ii., p. 281 (1894) ..	*erigida*.

Sect I.—Antennæ of male bipectinate with long branches to just beyond middle, the apical part ciliated.

1885. ELYDNA BOSCA.

Sect II.—(*Dyrzela*).—Antennæ of male strongly serrate above to middle, strongly fasciculate below.

1886. ELYDNA PLAGIATA.

Sect III.—Antennæ of male ciliated.

A. (*Leucocosmia*). Vertex of head of male with a cleft corneous ridge clothed with scales; abdomen clothed with woolly pile; fore and hindwings clothed with woolly hair above.

1875. ELYDNA RECLUSA.

Prodenia reclusa, Wlk., Journ. Linn. Soc. Zool. vi, p. 185 (1862).
Amphipyra agrotoides, Snell, Tijd. v., Ent. 1880, p. 77, pl. 6, f. 6.
Radinacra thoracica, Moore, Lep. Ceyl. iii, p. 31, pl. 148, f. 4, (1884).
Leucocosmia ceres, Butl. Trans. Ent. Soc., 1886, p. 394, pl. 9, f. 10.
Caradrina euthusa, Hmpsn., Ill. Het. B. M. viii, p. 79, pl. 145, f. 1 (1891).
" *heliarcha*, Meyr., Trans. Ent. Soc., 1897, p. 370.
" *unipunctata*, Beth. Baker, Nov. Zool. xiii., p. 201 (1906).
" *insignifica*, Beth. Baker, Nov. Zool. xiii, p. 201 (1906).

B. Vertex of head of male normal.

a. (*Floccifera*). Abdomen of male with large sublateral tufts of flocculent hair from base.

1938. ELYDNA ERIGIDA.

Aletia erigida, Swinh. Trans. Ent. Soc., 1890, p. 221.
Caradrina crenulata, Beth. Baker, Nov. Zool. xiii, p. 202 (1906).

b. Abdomen of male without sublateral tufts of long hair from base.

a^1. Hindwing of male with the costal area on underside clothed with rough downturned scales with thicker ridge of scales along subcostal nervure.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a^2. Hindwing of male on underside with ridge of scales on medial part of vein 1, covered by a thick fringe of hair from inner margin.

1874*a*. ELYDNA BIPUNCTA.

Cosmia bipuncta, Snell. Veth's. Midden. Sumatra Lep. 44, 1880.

Graphiphora stellata, Moore, Lep. Atk. p. 119 (1882).

Caradrina lophophora, Hmpsn., Trans. Ent. Soc., 1895, p. 299 ; id. Moths, Ind. iv., p. 512.

Caradrina pratti. Beth. Baker, Nov. Zool. xiii., p. 202 (1906).

b^2. (*Dadica*). Hindwing of male with the inner area normal.

1877. ELYDNA LINEOSA.

b^1. Fore and hindwings of male with the medial part of termen excised.

1877*a*. ELYDNA TRUNCIPENNIS.

Elydna truncipennis, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 168. (1910).

Head and thorax whitish suffused with pale rufous, the head rather whiter ; palpi black, whitish at tips and in front ; tarsi blackish ringed with white ; abdomen greyish suffused with fuscous brown. Forewing pale rufous with slight dark irroration, the terminal area rather darker ; subbasal line blackish, straight from costa to submedian fold in which there is a black point beyond it and a white point in cell further from base, antemedial line blackish, erect, slightly bent inwards to costa and incurved below submedian fold ; orbicular represented by a black point, the reniform by a small yellowish white spot usually with white point above it and two minute points below it ; a diffused dark medial line, oblique from costa to median nervure, then incurved ; postmedial line blackish, slightly bent inwards to costa and incurved below vein 3, with minute black streaks beyond it on the veins ; subterminal line indistinct, brown, slightly incurved between veins 6 and 4 ; a fine dark terminal line ; cilia fuscous brown with a fine whitish line at base. Hindwing whitish suffused with brown especially on the veins and terminal area ; cilia whitish with a brownish line near base from apex to vein 2 ; the underside with the costal area irrorated with brown, a small discoidal spot, postmedial series of slight black streaks on the veins and traces of a postmedial line towards costa.

Habitat.—JAPAN ; COREA ; N. CHINA ; W. CHINA ; PUNJAB, Kulu, Sultanpur ; SIKKIM ; ASSAM, Khasis ; CEYLON, Pundaluoya, *Exp.* 28-34 mill.

c^1. (*Elydna*) Wing of male normal.

a^2. Forewing grey brown.

a^3. Forewing with the postmedial line minutely dentate .. .. *ochreipuncta*.

b^3. Forewing with the postmedial line not dentate.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a^4. Forewing with series of black points on the veins beyond postmedial line .. .. *renalis.*

b^4. Forewing with series of short black streaks on the veins beyond postmedial line .. *rectilinea.*

b^3. Forewing with the ground colour ochreous yellow or red brown.

a^3. Forewing with blackish patches on costa at middle and before apex .. .. .. *bisignata.*

b^3. Forewing without blackish patches on costa.

a^4. Forewing with the postmedial line minutely waved and excurved beyond the cell.

a^5. Forewing with black discoidal spot .. *atripuncta.*

b^5. Forewing without black discoidal spot .. *ochracea.*

b^4. Forewing with the postmedial line not waved, angled at vein 6, then oblique .. .. *transversa.*

1869. ELYDNA OCHREIPUNCTA.

1878. ELYDNA RENALIS.

1878*a*. ELYDNA RECTILINEA.

Elydna rectilinea, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 172, pl. 141, f. 17 (1910).

Head and thorax whitish tinged with rufous, the head rather white; palpi fuscous, white at tips and in front; tarsi fuscous ringed with white; abdomen grey tinged with brown. Forewing pale grey tinged with pale reddish brown; subbasal line slight, dark, straight, from costa to submedian fold; antemedial line blackish, oblique, straight or slightly incurved in submedian interspace, slightly bent inwards to costa; orbicular represented by a minute dark point, the reniform by some white scales; a diffused dark medial shades oblique from costa to lower angle of cell, then blackish; postmedial line blackish, erect, straight, slightly bent inwards to costa, with minute black streaks beyond it on the veins; subterminal line indistinct, dark, rather diffused, excurved below vein 7 and at middle; a fine brown terminal line with minute white points at the veins; cilia grey-brown with a slight yellowish line at base. Hindwing whitish suffused with brown; a fine brown terminal line; cilia whitish with the yellowish line at base; the underside white, the marginal areas irrorated with brown, a brown discoidal lunule, diffused sinuous subterminal line and terminal series of black striæ.

Habitat.—PUNJAB, Kulu, Sultanpur, Dalhousie. *Exp.* 32 mill.

2058*a*. ELYDNA BISIGNATA.

2058*b*. ELYDNA ATRIPUNCTA.

Elydna atripuncta, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 175, pl. 141, f. 21 (1910).

♀. Head white, the palpi, frons, and antennæ except at base dark

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

brown; thorax white tinged with ochreous and irrorated with a few black scales; tibiæ and tarsi brown; abdomen whitish dorsally tinged with ochreous and irrorated with a few dark scales except at base. Forewing white tinged with ochreous and irrorated with black scales, the terminal area tinged with rufous; antemedial line brown, double on inner area, oblique towards costa, then waved, angled outwards at vein 1; a round black discoidal spot; postmedial line brown, excurved and minutely waved to vein 2, angled inwards in submedian fold to near antemedial line and outwards on vein 1; subterminal line brown, diffused, oblique from costa to vein 7, incurved at discal and submedian folds; a series of small black spots before termen; cilia ochreous with a series of fuscous points. Hindwing whitish suffused with ochreous yellow especially on terminal area; the underside whitish, the costal and terminal areas irrorated with brown, a small discoidal spot.

Habitat.—CEYLON, Puttalam. *Exp.* 36 mill.

2058. ELYDNA OCHRACEA.

2057. ELYDNA TRANSVERSA.

Genus ANDROLYMNIA. *Type.*

Androlymnia, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 179 (1910) .. .. *emarginata.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and slenderly scaled, the 3rd long; frons smooth, with large tuft of hair above; eyes large, round; antennæ of male somewhat laminate and almost simple; thorax clothed chiefly with scales, the prothorax with ridge-like crest, the metathorax with spreading crest; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing typically with the apex produced and acute, the termen excised below apex and excurved at middle, the inner margin with antemedial lobe and scale tooth; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from first below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2098. ANDROLYMNIA EMARGINATA.

Genus NICARA. *Type.*

Nikara, Moore, Lep. Atk., p. 126 (1882) .. .. *castanea.*

Proboscis fully developed; palpi upturned, short, the 2nd joint broadly scaled, the 3rd minute; frons smooth; eyes large, round; antennæ of male minutely ciliated; thorax clothed almost entirely with scales and without crests. Forewing rather short and broad, the apex rounded, the termen obliquely curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1792. NICARA CASTANEA.

Genus APOCALYMNIA.

Type.

Apocalymnia, Hmpsn., Cat. Lep. Phal. B. M., ix, p. 184 (1910) .. .. *tenebrosa.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons with large corneous process with raised edges; eyes large, round; antennæ of female laminate; head and thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with slight crest; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen slightly waved and somewhat excised towards tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole: 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1874c. APOCALYMNIA TENEBROSA.

Genus CALYMNIA.

Type.

Calymnia, Hübn. Verz., p. 235 (1827).. .. .. *trapezina.*

Eustegnia, Hübn. Verz., p. 236 (1827).. .. .. *diffinis.*

Euperia, Guen. Ann. Soc. Ent. Fr., 1839, p. 486 .. *trapezina.*

A. Forewing with the postmedial line obliquely down curved from costa to vein 6.

a. Forewing with wedge-shaped white patch on costa at postmedial line .. .. *restituta.*

b. Forewing without wedge-shaped white patch on costa at postmedial line .. .. .. *flavifimbria.*

B. Forewing with the postmedial line oblique from costa to vein 6 .. .. *ochreimargo.*

2055. CALYMNIA RESTITUTA.

Cosmia restituta, Wlk., x, 490 (1856).

Calymnia picta, Stand. Stett. Ent. Zeit., 1888, p. 257, id., Rom. Mem., vi, p. 503, pl. 10, f. 2.

2056. CALYMNIA FLAVIFIMBRIA.

Cosmia affinis, Hmpsn., Moths. Ind., ii, p. 321 part. (nec. Linn).

Calymnia flavifimbria, Hmpsn., Cat. Lep. Phal. B. M., ix, p. 193, pl. 141, f. 27 (1910).

1873. CALYMNIA OCHREIMARGO.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus BASILICA.

Type.

Basilica, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 209 (1910) *chrysosticta.*

2689*a*. BASILICA CHRYSOSTICTA.

Genus MUDARIA.

Type.

Mudaria, Moore, Indian Museum, Notes iii, p. 68 (1893) *cornifrons.*

1825. MUDARIA CORNIFRONS.

Genus PHRAGMATIPHILA.

Type.

Nonagria, Hübn. Verz., p. 241 (1827), Nec. Treit., 1825. . . . . *typhæ.*

Phragmatiphila, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 266 (1910). *nexa.*

Proboscis aborted, minute; palpi porrect, hardly extending beyond the frons and fringed with long hair below; frons with transverse corneous plate at middle, square in front and concealed by hair; eyes large, round; antennæ of male typically serrate and fasciculate; thorax clothed with hair only, the pro and metathorax with slight spreading crests; tibiæ fringed with long hair; abdomen with some rough hair at base and dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 9 from 10 anastomosing with 8 to form a rather long areole; 6 from the areole or cell; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 on a long stalk; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male minutely serrate and fasciculate.

1978*a*. PHRAGMATIPHILA FUMEA.

Sect. II—Antennæ of male ciliated.

A. Forewing with the small reniform with dark centre and pale annulus open above and below . . *leucaneura.*

B. Forewing with the reniform a pale lunule . . *grisescens.*

1978*b*. PHRAGMATIPHILA LEUCANEURA.

Phragmatiphila leucaneura, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 269, pl. 143, f. 1. (1910).

♂. Head and thorax dark brown, the scales tipped with grey; pectus and legs dark brown mixed with greyish, the tarsi blackish ringed with white; abdomen greyish suffused and irrorated with dark brown. Forewing greyish ochreous strongly suffused and irrorated with dark brown, the veins of costal area with slight pale streak; traces of a curved blackish antemedial line; orbicular and reniform very small, ochreous, defined by black except above and with some black before and between them, the former rather triangular, the latter with black striga in centre; traces of an oblique blackish medial line from lower angle of cell to inner margin; an oblique postmedial series of slight black points on the veins from vein 6 to inner

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

margin; an oblique, ochreous shade from apex; an oblique ochreous line from termen just below apex to inner margin, fine towards apex and broadening towards inner margin, defined on each side by dark brown suffusion; a terminal series of black points; cilia ochreous tipped with brown. Hindwing ochreous suffused with brown, the base and termen paler; the underside ochreous irrorated with brown, the terminal half suffused with brown, a dark discoidal spot.

Habitat.—BURMA, Hsipaw. *Exp.* 26 mill.

1798*c*. PHRAGMATIPHILA GRISESCENS.

Phragmatiphila grisescens, Hmpsn., Cat. Lep. Phal. B. M. ix. p. 270, pl. 143, f. 2 (1910).

♀. Head and thorax grey tinged with dull brown; pectus, legs and abdomen suffused with fuscous. Forewing grey tinged with brown and irrorated with fuscous, the cell and area just below it suffused with fuscous, the terminal area suffused with fuscous narrowing to a point at apex; traces of a blackish antemedial line bent inwards to costa and excurved in cell and submedian interspace; reniform a small ochreous lunule defined by black; traces of an oblique waved medial line from cell to inner margin; traces of a blackish postmedial line, oblique towards costa, then with series of black points beyond it on the veins, excurved to vein 4, then oblique; a terminal series of minute black lunules defined on inner side by slight ochreous lunules. Hindwing greyish suffused with fuscous brown; the underside brownish white irrorated with brown, a small dark discoidal spot.

Habitat.—SIKHIM, 1,800′. *Exp.* 34 mill.

Genus CALAMISTIS.

Type.

Calamistis, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 273 (1910) .. *fusca.*

Proboscis aborted, minute; palpi upturned, the 2nd joint reaching to middle of frons and fringed with long hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male typically bipectinate with moderate branches to apex; thorax clothed with long hair and hair-like scales, the pro-and metathorax with spreading crests; tibiæ fringed with long hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with moderate branches to apex.

1942*a*. CALAMISTIS PRÆPALLENS.

Calamistis præpallens, Hampsn., Cat. Lep. Phal. B. M. ix, p. 275, pl. 143, f. 7 (1910).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♂. Head and thorax fuscous brown tinged with grey; hind legs whitish; abdomen white, slightly tinged with brown. Forewing grey-brown, the costal half paler; a diffused pale rufous fascia in discal fold from middle of cell to subterminal line: a black streak below basal half of cell; orbicular represented by a black point above median nervure, the reniform by a small fuscous spot at lower angle of cell slightly defined by white, its upper part defined by slight black points; a rather wedge-shaped black subterminal spot in discal fold with traces of black points on the veins from it to inner margin; a terminal series of slight black striæ. Hindwing white with fine dark terminal line; the underside with the costal area and terminal area to vein 3 tinged with pale rufous.

Habitat.—TRAVANCORE, Pirmad. *Exp.* 30 mill.

Sect. II.—Antennæ of male ciliated.

A. Forewing with the inner half pale to subterminal line .. .. *microsticta.*

B. Forewing with the basal half of inner area concolorous .. .. *submarginalis.*

1793. CALAMISTIS MICROSTICTA.

1946. CALAMISTIS SUBMARGINALIS.

Genus RABILA. *Type.*

Rabila, Wlk., xxxii., 507 (1865) .. .. *frontalis.*

1591. RABILA FRONTALIS.

Genus ARENOSTOLA. *Type.*

Arenostola, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 281 (1910). *phragmitidis.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately fringed with hair in front, the 3rd short, porrect; frons smooth, with tuft of hair; eyes large, round; antennæ of male ciliated; thorax clothed with hair and hairlike scales, the prothorax with slight spreading crest, the metathorax without crest; tibiæ moderately fringed with hair; abdomen without crests. Forewing with the apex somewhat produced and acute, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1942*b*. ARENOSTOLA PROCERA.

Tapinostola procera., Staud. Stett. Ent. Zeit. 1889, p. 47; Hmpsn. Cat. Lep. Phal. B. M. ix, p. 286, pl. 143, f. 19; Staud, Cat. Lep. pal., p. 189.

Head and thorax ochreous white mixed with brown; palpi and legs brownish; abdomen ochreous white tinged with brown. Forewing ochreous white tinged with pale rufous and rather thickly irrorated with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fuscous brown, the veins slightly streaked with brown; traces of a post-medial series of dark points on the veins, excurved to vein 4, then oblique; a terminal series of brown striæ. Hindwing white tinged with ochreous; the underside with the costal area and terminal area to vein 2 irrorated with brown.

Habitat.—W. TURKESTAN; E. TURKESTAN; MONGOLIA; KASHMIR, Numbra. *Exp.* 30-34 mill.

Genus SPHETTA. *Type.*

Sphetta, Wlk., xxxii., 457 (1865) .. .. *apicalis.*

1585. SPHETTA APICALIS.

Genus. ACRAPEX. *Type.*

Acrapex, Hmpsn. Moths Ind. ii, p. 286 (1894) .. .. *prisca.*

Acutipenna, Hmpsn. Moths Ind. ii, p. 287 (1894) .. *acuminata.*

Sect. I. (*Acutipenna*)—Antennæ of male annulated and ciliated.

1954. ACRAPEX ACUMINATA.

Sect. II. (*Acrapex*)—Antennæ of male ciliated and not annulate.

A. Forewing with hooked white mark above median nervure in lower extremity of cell .. .. *hamulifera.*

B. Forewing without hooked white mark above median nervure.

a. Forewing with dark shade along median nervure.

a^1. Forewing with pale streaks on the veins of costal area only .. .. .. *brunnea.*

b^1. Forewing with pale streaks on all the veins.

a^2. Head and tegulæ black.. .. .. *atriceps.*

b^2. Head and tegulæ not black.

a^3. Forewing ochreous white tinged with fuscous brown .. .. .. *leucophlebia.*

b^3. Forewing pale pinkish rufous .. .. *prisca.*

b. Forewing without dark shade along median nervure .. .. *roseotincta.*

1952. ACRAPEX HAMULIFERA.

1952*a*. ACRAPEX BRUNNEA.

Acrapex brunnea, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 318, pl. 144, f. 11 (1910).

Head and tegulæ dark brown slightly mixed with ochreous; thorax ochreous tinged with rufous; pectus and legs ochreous mixed with brown; abdomen ochreous suffused with brown. Forewing ochreous, the costal area suffused with red-brown leaving slight pale streaks on the veins; a diffused brown streak along median nervure and thence to the subterminal oblique fascia, with two white points on it at lower angle of cell; a slight brown streak below base of cell; an oblique pale fascia from apex to discal fold, with a diffused brown fascia below it from termen below apex to vein 3,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with minute black streaks on it in the interspaces; a terminal series of slight black lunules; cilia ochreous mixed with brown and with brown line near base. Hindwing ochreous white, the veins and terminal area tinged with brown; a fine brown terminal line; cilia whitish with a slight brown line near base; the underside whitish with the costal and terminal areas irrorated with reddish brown.

Ab. 1.—Hindwing more uniformly tinged with brown.

Ab. 2.—Forewing without the white points at lower angle of cell.

Habitat—Br. E. Africa; Uganda; Mashonaland; Gazaland; Transval; Natal; Ceylon, Maskeliya; Borneo, Pulo Laut; Br. N. Guinea; Queensland; S. Australia. *Exp.* 20-30 mill.

1951b. Acrapex atriceps.

Acrapex atriceps, Hmpsn. Cat. Lep. Phal. B. M. ix., p. 319, pl. 144, f. 13 (1910).

♂. Head and tegulæ black; thorax ochreous tinged with rufous; with a black dorsal stripe; pectus and legs dark brown, the hind tibiæ and tarsi ochreous above; abdomen ochreous. Forewing pale ochreous slightly tinged with rufous, the veins defined by brown streaks except on inner area beyond the oblique subapical fascia, the costal edge black-brown: a diffused brown mark at lower angle of cell with white points in and beyond the angle defined by some black scales; an oblique brown fascia from termen below apex to vein 3 where it is diffused inwards to lower angle of cell; a terminal series of black striæ; cilia with black line at middle and mixed with black at tips. Hindwing ochreous white slightly tinged with red-brown; cilia ochreous white with a faint brown line at middle; the underside whitish slightly irrorated with brown, the costal area suffused with brown.

Habitat.—Assam, Khasis. *Exp.* 26 mill.

1953. Acrapex leucophlebia.

1951. Acrapex prisca.

1951c. Acrapex roseotincta.

Acrapex roseotincta, Hmpsn, Cat. Lep. Phal. B. M. ix., p. 320, pl. 144 f. 16 (1910).

♀. Head and thorax ochreous tinged with brown; abdomen ochreous white. Forewing pale ochreous yellow faintly tinged with rufous and the veins slightly streaked with rufous; a slight blackish streak below basal half of cell; some black scales at lower angle of cell; an oblique postmedial veins of black points on veins 6 to 1; an oblique diffused rufous fascia from termen below apex to vein 3; a slight brown terminal line cilia yellowish white with a faint brownish line through them. Hindwing white faintly tinged with ochreous; the underside white with the costal area tinged with ochreous.

Habitat.—Ceylon, Maskeliya. *Exp.* 22 mill.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus SESAMIA.

	Type.
Sesamia, Guen. Noct. i., p. 95 (1852)	*vuteria.*
Microsemyra, Butl. P. Z. S. 1883, p. 155	*pallida.*

Sect. I.—Antennæ of male bipectinate with extremely short branches, the apex serrate.

A. (*Microsemyra*), Hindwing with veins 3·4 strongly stalked in male from cell in female.

1950. SESAMIA PALLIDA.

B. Hindwing with veins 3·4 from cell in both sexes.

1943. SESAMIA INFERENS.

Leucania inferens, Wlk. ix. 105 (1856); Moore, Lep. Ceyl. iii. p. 8, pl. 145, f. 3.

,, *proscripta*, Wlk. ix. 106 (1856).

Sesamia albiciliata, Snell, Tijd. v. Ent. xxiii., p. 44, pl. 4, f. 3 (1880).

,, *tranquillaris*, Butl. P. Z. S. 1880, p. 674.

Nonagria gracilis, Butl. P. Z. S. 1880, p. 675.

,, *innocens*, Butl. Trans. Ent. Soc. 1881, p. 173.

Sect. II.—Antennæ of male with fasciculate cilia.

A. Forewing ochreous slightly tinged with rufous .. *cretica.*

B. Forewing ochreous slightly tinged with olive .. *uniformis.*

1943*a*. SESAMIA CRETICA.

Leucania hesperica, Frr. Neue Beitr vi, p. 32, pl. 501, f. 2 (1852). nec. Rmbr.

Sesamia cretica, Led. Noct. Eur., p. 225 (1857); Staud. Cat. Lep. pal. p. 190.

Nonagria cyrnæa, Mab. Ann. Soc. Ent. Fr. 1866, p. 559, pl. 8, f. 7 and 1867, p. 640, pl. 14, f. 1.

Sesamia fraterna, Moore, Lep. Atk. p. 103 (1882).

,, *striata*, Staud. Stett. Ent. Zeit. 1888, p. 27.

Head and thorax pale ochreous tinged with rufous; palpi, sides of frons and fore femora above brownish; abdomen ochreous white; forewing pale ochreous tinged with rufous especially on terminal half, the veins with slight pale streaks; faint fuscous streaks above and below extremity of median nervure, and beyond the cell above and below vein 4; sometimes with slight antemedial dark point in submedian fold and postmedial series of points on the veins with points before them in discal and submedian folds; a fine brown terminal line; cilia ochreous tinged with rufous and with fine pale lines at base and middle. Hindwing pure white.

Ab. 1.—*striata.* Forewing with dark streak below base of cell and streaks; on the veins of terminal area . . Asia Minor, Syria, W. Turkestan.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Habitat.—CORSICA; CENTR. ITALY; DALMATIA; CRETE; EGYPT; SUDAN; BASUTOLAND; ADEN; ASIA MINOR; SYRIA; W. TURKESTAN; PUNJAB, Kangra, Dharmsala; SIKKIM. *Exp.* 30-42 mill.

Larva, Kirby, Eur. Butt. and Moths, p. 166; Hffm. Raup., p. 105.

Ochreous whitish; head rufous; spiracles black. Foodplant, in stalks of maize.

1943*b*. SESAMIA UNIFORMIS.

Nonagria uniformis, Dudgeon, J. Bomb. N. H. Soc. xvi, p. 402 (1905).

Head and thorax pale ochreous slightly tinged with brown; palpi fuscous, whitish below; frons tinged with fuscous; fore and mid legs irrorated with fuscous; abdomen ochreous white. Forewing olive ochreous sparsely irrorated with dark brown; an antemedial black point in submedian fold; a slight diffused fuscous shade on extremity of median nervure and just beyond lower angle of cell; a slight black point in lower angle of cell and another in discal fold just beyond the discocellulars; postmedial black points in discal and submedian folds with races of a curved series of black points beyond them on the veins; a fine blackish terminal line not quite reaching apex and tornus; cilia ochreous white with faint brownish lines near base and tips. Hindwing pure white; the underside with the costal area slightly tinged with ochreous and irrorated with brown.

Habitat.—BENGAL, Burogah; BOMBAY, Surat. *Exp.* ♂ 32, ♀ 34-38 mill.

Larva. Destructive to sugar-cane.

Genus XYLOSTOLA. *Type.*

Xylostola, Hmpsn., Cat. Lep. Phal. B. M., ix, p. 335 (1910).. *indistincta.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and broadly fringed with scales in front, the 3rd long; frons with small rounded prominence covered by a tuft of hair; eyes large, round; antennæ of male ciliated; thorax clothed with hair and hair-like scales, and without crests; tibiæ fringed with rather long hair; abdomen with some rough hair at base, but without crests. Forewing with the apex rather produced and acute, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with black lunules in centre and on outer edge of reniform.. .. .. .. *robusta.*

B. Forewing with the reniform defined by black points *indistincta.*

1945. XYLOSTOLA ROBUSTA.

1889. XYLOSTOLA INDISTINCTA.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus ARCILASISA.

Type.

Arsilasisa, Wlk., xxxii., 470 (1865) .. .. .. *sobria.*

1939. ARSILASISA SOBRIA.

Genus CLETHRORASA.

Type.

Clethrorasa., Hmpsn., Cat. Lep. Phal. B. M., ix., p. 343 (1910) .. .. *pilcheri.*

Proboscis fully developed ; palpi upturned, the 2nd joint smoothly scaled and flattened against the frons, the 3rd short ; frons smooth, eyes large, round; antennæ of male almost simple; thorax clothed almost entirely with scales and without crests ; tibiæ smoothly scaled ; abdomen with dorsal crests on basal segments. Forewing narrow, the margins subparallel, the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle, 9 from 10 anastomosing with 8 to form the areole, 11 from cell. Hindwing with veins 3·4 from angle of cell ; 5 obsolescent from just below middle of discocellulars ; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1960*a*. CLETHRORASA PILCHERI.

Genus. APSARASA.

Type.

Apsarasa, Moore, P. Z. S., 1867., p. 665 .. .. *radians.*

A. Hindwing with the white patch extending almost to cell .. .. *radians.*

B. Hindwing with irregular white patch on termen .. *figurata.*

1962. APSARASA RADIANS.

1962*a*. APSARASA FIGURATA.

Apsarasa figurata, Moore, P. Z. S., 1877, p. 604; Hmpsn., Cat. Lep. Phal. B. M., ix., p. 347., pl. 144, f. 32.

♀. Head and thorax blue-black ; palpi with white spot on basal joint in front ; frons with yellowish white patch above; vertex of head and tegulæ at middle and tips with yellowish white bands ; pro- and meso-thorax with yellowish spots and meta-thorax with yellowish patch ; coxæ with white patches ; femora at extremities, tibiæ and tarsi, with white bands ; abdomen black-brown tinged with metallic blue, the two basal segments with yellowish white dorsal spots. Forewing blue-black, the costal terminal and inner areas with yellowish white patches leaving radiating blue-black bars and streaks ; the costal area with three small yellowish white spots on costal area followed by an oblique striga, then an erect striga, and irregular medial patch, a slight bar above end of cell followed by a striga, a triangular patch towards apex followed by an oblique bar and triangular patch at apex ; the terminal area with two short oblique streaks towards apex with point before the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

upper one, a minute streak at vein 5 and four oblique triangular patches between vein 4 and tornus; the inner area with small triangular antemedial spot followed by a striga, a broad medial band from submedian fold to inner margin extending to just above the fold at extremity, followed by a wedge-shaped spot, then a narrow bar and wedge-shaped spot towards tornus; a yellowish white point at middle of cell and another at upper angle. Hindwing black-brown with some white on termen between vein 4 and tornus, its inner edge very irregular and angled inwards below veins 4 and 3; the underside with antemedial white spot on costa, slight streak in base of cell, some whitish below base of cell, faint medial band from costa to discal fold, slight postmedial spots below costa and vein 8, two short subapical streaks and slender elongate streaks above and below discal fold.

Habitat.—ANDAMANS. *Exp.* 46-50 mill.

Genus CHASMINA.

	Type.
Chasmina, Wlk., ix, 146 (1856)..	*tibialis.*
Sphragifera, Staud, Rom. Mén. vi, p. 544 (1892)	*sigillata.*
Clinophlebia, Hmpsn., Ill. Het. B. M., ix, p. 92 (1893) ..	*sericea.*

Sect. I. (*Clinophlebia*).—Forewing of male with the apex rectangular, the costa somewhat excised beyond middle and the costal neuration slightly distorted.

1957. CHASMINA SERICEA.

Sect. II (*Chasmina*).—Forewing with the apex rounded, the costa not excised, the neuration normal.

A. Forewing without subapical or postmedial dark patches.
  a. Forewing without postmedial line .. .. *tibialis.*
  b. Forewing with postmedial line .. .. *judicata.*
B. Forewing with sinuous dark patch from costa before apex .. .. *rejecta.*
C. Forewing with elliptical rufous patch in and beyond end of cell .. .. *maculata.*

1958. CHASMINA TIBIALIS.

Noctua tibialis, Fabr, Syst. Ent., p. 578 (1775).
Leocymà vestæ, Guen., Noct. ii, p. 213 (1852).
,, *dianae*, Guen., Noct. ii, p. 213 (1852).
Chasmina cygnus, Wlk., ix, 147 (1856); Butl., Ill. Het. B. M., vi, p. 35, pl. 110, f. 3.
,, *glabra*, Wlk., xxxii, 636 (1865).
Xanthodes, mariæ, Mab., C. R. Ent. Soc. Belg., xxv., p. lx (1884).

1959. CHASMINA JUDICATA.

1960. CHASMINA REJECTA.

Noctua rejecta, Fabr., Syst. Ent., p. 601 (1775).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Acontia bimacula, Wlk., xii, 796 (1857); Butl., Ill. Het. B. M., iii, p. 20, pl. 45, f. 8.

Chasmina stigmata, Hmpsn., Ill. Het. B. M., viii, p. 73, pl. 145, f. 10. (1891).

1961. CHASMINA MACULATA.

Genus CALLYNA.

	Type.
Callyna, Guen., Noct., i, p. 112 (1852)	*siderea*.
A. Abdomen with the terminal segments orange ..	*siderea*.
B. Abdomen with the terminal segments not orange.	
a. Forewing with ante and postmedial black patches on costa	*costiplaga*.
b. Forewing without ante and postmedial black patches on costa.	
a^1. Forewing with dark fascia in discal fold between postmedial and subterminal lines.	
a. Forewing with the claviform represented by a small black spot	*jugaria*.
b^2. Forewing with the claviform absent.	
a^3. Forewing with the postmedial line dentate from costa to vein 4	*semivitta*.
b^3. Forewing with the postmedial line oblique and straight from costa to vein 4. ..	*mystica*.
b^1. Forewing without dark fascia in discal fold between postmedial and subterminal lines ..	*monoleuca*.

2169. CALLYNA SIDEREA.

2173. CALLYNA COSTIPLAGA.

2171. CALLYNA JUGARIA.

2171*a*. CALLYNA SEMIVITTA.

Callyna semivitta, Moore, Lep. Atk., p. 161 (1882); Waterh. Aid. ii., pl. 160, f. 3.

♀. Head deep chocolate brown mixed with some white; palpi with the 1st and 2nd joints white in front; thorax chocolate-red, the tegulæ white at base; pectus and legs brown mixed with white, the tibiæ and tarsi ringed with white; abdomen grey-brown, the ventral surface irrorated with white. Forewing chocolate red with a purple gloss, irrorated with a few white scales, the base and the area below the costa and the upper part of cell thickly irrorated with ochreous white to the postmedial line; subbasal line indistinctly double filled in with white, waved from costa to submedian fold; antemedial line defined on each side by ochreous white, waved, interrupted, obsolete below submedian fold, an oblique white striga before it across the cell; orbicular and reniform with white annuli defined by black, the former with some ochreous scales in centre, its outer edge produ-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ced to a streak connected with the reniform, which has an ochreous centre, narrow, rather constricted at middle and slightly angled inwards on median nervure; postmedial line double filled in with ochreous white, irregularly waved, oblique from costa to vein 4, below vein 3 represented by white points on the veins, a black-brown fascia from it to subterminal line in discal fold; some white points on postmedial part of costa; an apical ochreous white patch extending on to the cilia at apex and with dark striæ on it at termen and dark wedge-shaped mark before it below costa; the subterminal line represented by an excurved ochreous white mark below the apical patch and two points in discal fold, then very faint, incurved below vein 3 and with slight dark mark on it at submedian fold; a terminal series of white points. Hindwing fuscous brown with a cupreous gloss; the cilia greyish intersected with white at the veins and tipped with white between veins 6 and 4; the underside brown irrorated with white, especially on basal half, the inner area greyish, a brown discoidal lunule and diffused medial band, some white on termen between veins 2 and 1.

Habitat.—PUNJAB, Kulu; SIKKIM. *Exp.* 48-66 mill.

2172. CALLYNA MYSTICA.

2170. CALLYNA MONOLEUCA.

Callyna monoleuca, Wlk. xv., 1667 (1858).

Leocyma apicalis, Snell. Tijd. v., Ent. xxiii, p. 54, pl. 4, f. 9 (1880).

Genus SEUDYRA. *Type.*

Seudyra, Stretch, Cist. Ent. ii, p. 19 (1875) . .. *transiens.*

Sect. I.—Palpi with the 3rd joint long; midwing with the termen slightly excised at submedian fold and the tornus lobed.

1571. SEUDYRA VENOSA.

Sect. II.—Palpi with the 3rd joint moderate; hindwing with the termen evenly curved.

A. Forewing with the apex produced, the termen obliquely curved.

a. Hindwing without discoidal spot .. .. *longipennis.*

b. Hindwing with black discoidal spot .. .. *catocalina.*

1572. SEUDYRA LONGIPENNIS.

1573. SEUDYRA CATOCALINA.

Phægorista catocalina, Wlk., xxxv. 1859 (1866); Butl. Ill. Het. B. M. v., p. 20, pl. 82, f. 9; Kirby, Cat. Lep. Het., p. 38.

Zalissa exigvifascia, Swinh., Cat. Het. Mus. Oxon. 1, p. 167 (1892).

B. Forewing with the apex not produced, the termen much less obliquely curved.

a. Both wings with the termen not crenulate.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a[1]. Hindwing with the terminal band expanding into a large quadrate patch above tornus .. *bala.*

b[1]. Hindwing with the terminal band not expanding into a large quadrate patch above tornus .. *transiens.*

1570. SEUDYRA BALA.

1569. SEUDYRA TRANSIENS.

Eusemia transiens, Wlk., vii. 1588 (1856); Kirby, Cat. Lep. Het. p. 38.

Phægorista catocaloides, Wlk., Journ. Linn. Soc. Zool., vi, p. 87 (1862).

Agarista ægoceroides, Feld. Reis. Nov., pl. 107, f. 10 (1878).

Seudyra dissimilis, Swinh. Trans. Ent. Soc., 1890, p. 174.

b. Both wings with the termen crenulate.

a. Forewing with curved white patch beyond the cell .. .. *albifascia.*

b. Forewing with quadrate white spot in end of cell .. .. *nepcha.*

1574. SEUDYRA ALBIFASCIA.

1575. SEUDYRA NEPCHA.

Genus. PROTOSEUDYRA.

Type.

Protoseudyra, Hmpsn., Cat. Lep. Phal. B. M., ix, p. 443. (1910) .. .. *picta.*

Proboscis fully developed; palpi porrect, extending about the length of head, the 2nd joint moderately fringed with hair below, the 3rd short; frons with rounded prominence with minute pointed corneous process at middle; eyes large, round; antennæ of male ciliated; thorax clothed with hair and hair-like scales and without crests; fore tibiæ fringed with long hair: the mid and hind tibiæ moderately fringed with hair; abdomen with very large crest of curled metallic scales at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1872. PROTOSEUDYRA PICTA.

Genus OPSYRA.

Type.

Opsyra, Hmpsn., Cat. Lep. Phal. B. M. ix, p. 445 (1910) .. *chalcoela.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to vertex of head and moderately fringed with scales in front, the 3rd short, porrect; frons smooth; eyes large, round; antennæ of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

male minutely ciliated; thorax clothed chiefly with scales, the pro and metathorax with spreading crests of very long spatulate scales, the patagia fringed with long rough scales at extremity; tibiæ fringed with rather long hair; abdomen with large crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2174*a*. OPSYRA CHALCOELA.

Genus MICRAPATETIS.

Type.

Micrapatetis, Meyr., Trans. Ent. Soc. 1897, p. 369 .. *orthozona*.

Axiorata, Turner, P. Linn. Soc. N. S. W. xxvii., p. 120 (1902). *leucozona*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about vertex of head and moderately scaled, the 3rd short; frons with rounded prominence; eyes large, round; antennæ of male ciliated; thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with large spreading crest; tibiæ slightly fringed with hair; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7. 8. 9. 10 stalked; 11 from cell. Hindwing with veins 3·4 shortly stalked; 5 obsolescent from middle of discocellulars; 6-7 from upper angle or stalked; 8 anastomosing with the cell to near middle.

A. Forewing ochreous suffused with purplish red .. *pyrastis*.

B. Forewing dark red-brown with the basal area yellow .. *flavipars*.

1962*a*. MICRAPATETIS PYRASTIS.

Micrapatetis pyrastis, Hmpsn., Cat. Lep. Phal. B. M., ix. p. 454, pl. 146., f. 22 (1910).

♀. Head and tegulæ purplish grey; thorax pale purplish red; palpi, pectus and legs blackish mixed with grey; abdomen purplish red. Forewing pale purplish red, the basal half with an ochreous tinge; a medial leaden grey band defined at sides by black lines, slightly constricted at discal fold and strongly at submedian fold, some slight pale points beyond it on costa; cilia whitish at base, blackish at tips. Hindwing fuscous with a purplish grey tinge; cilia whitish with a fuscous line through them; the underside rather paler with faint diffused curved postmedial line.

Habitat.—MADRAS, Gooty. *Exp.* 18 mill.

1962*b*. MICRAPATETIS FLAVIPARS.

Micrapatetis flavpiars, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 454 pl. 146, f. 23 (1910).

♀. Head and tegulæ dark greyish brown; thorax ochreous yellow

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pectus, legs and abdomen greyish brown. Forewing with the basal area ochreous yellow defined by the fine black antemedial line, which is minutely waved and somewhat oblique, the base of costa with a brown fascia; the rest of wing dark red-brown with a silvery gloss; an indistinct diffused red-brown postmedial line. Hindwing reddish brown with a greyish tinge, a fine pale line at base of cilia.

Habitat.—BOMBAY. *Exp.* 18 mill.

Genus HYPOCALAMIA.

Type.

Hypocalamia, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 495 (1910) .. .. .. *meterythra*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to middle of frons and moderately fringed with scales in front, the 3rd short; frons smooth; eyes larger, round; antennæ of male ciliated; thorax clothed with hair only and without crests; tibiæ moderately fringed with hair; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1709. HYPOCALAMIA METERYTHRA.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART VII.

(With Plates XXXIII to XXXIX and text-figures 24 to 27.)

(Continued from page 391 of this Volume.)

COPERNICIA, Mart. Hist. Nat. Palm. III, 242, t. 49, 50 (excl. t. 50, A I—IV).

(After Nicolaus Copernicus, the famous astronomer, 1473-1543.)

Kunth, Enum. Pl. III, 343.—Griseb. Fl. Brit. W. Ind. 544.—Benth. et Hook. f. Gen. Pl. III, 927 (excl. *Crysophila*).—Becc. in Webbia II (1907), 140.

Stem erect, mostly of considerable height, rarely low, annulate in the lower part, covered higher up with the bases of the persistent petioles. Leaves terminal, flabelliform. Petioles with strong spines and a ligule. Segments induplicate, often with fibres between the segments.

Spadices elongate-paniculate, much-branched, with several tubular spathes and superposed partial inflorescences, which are divided into several flower-bearing branchlets; each branchlet provided with a more or less tubular spathe or with a simple bract at the point of its origin. Flowers hermaphrodite, single or in clusters, sessile, bracteate or bracteolate. Calyx tubular, more or less deeply 3-dentate. Corolla more or less distinctly tubular below, divided in 3 valvate, narrow segments, which are strongly sculptured-alveolate on the inner side. Stamens 6; filaments united at the base with the corolla-tube and forming in the throat a 6-lobed or 6-dentate corona, suddenly restricted and subulate in the upper part, anthers ovate or oblong, dorsifixed. Ovary consisting of 3 carpels which are free below and united above into one common style; stigma tridenticulate.

Fruit globose or ovoid, formed by one carpel, with the rest of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the abortive carpels at the apex; endocarp crustaceous-woody, thin. Seed free in the endocarp; hilum basilar; albumen deeply ruminate; embryo basilar near the hilum.

Species about 9.

DISTRIBUTION.—Brazil, Venezuela, Argentine, S. Domingo, Cuba, New Granada.

COPERNICIA CERIFERA, Mart. Hist. Nat. Palm. III, 56, t. 49 et 50 (excl. fig. 10) et 242 (partim).—Becc. in Webbia, II (1907) 145—*Corypha cerifera*, Man. Arruda da Camara, in Koster Travels in Brazil (1816) App. (ex. Mart. l. c. 56).

NAMES.—Brazilian Wax Palm; Carnauba (in Brazil).

DESCRIPTION.—Stem 30-40 feet high, cylindric, erect, at the base usually slightly thickened, 6-8 inches in diameter, covered with the bases of fallen leaves, either in the upper part only or throughout. Leaves 4-6$\frac{2}{3}$ feet long, forming a large spherical crown. Petiole 2-3 feet long with the base dilated, depressed, a little concave above and convex below, armed on the margins with stout, compressed spines; ligule glabrous, semirotundate-oblong, finely coriaceous; rhachis O; limb suborbicular in outline, flabelliform-multifid, undivided in the central part for about 1-1$\frac{1}{3}$ feet from the apex of the petiole and on the sides only for about $\frac{4}{5}$-1$\frac{1}{5}$ inches, thinly coriaceous, cereo-pulverulent or whitish on both surfaces, divided into about 60 segments; central segments 2$\frac{3}{5}$ feet long from the apex of the petiole and about 1$\frac{2}{5}$ inches wide where broadest.

Spadices much elongate, erect-patent, 5-6 feet long, thrice divided, composed of several partial inflorescences which are alternately superposed. Primary spathes elongate, tubular, cylindric (at least above where they measure about $\frac{1}{2}$ inch in diameter), finely striate lengthwise, glabrous, obliquely truncate at the mouth where the margin is entire or scarcely reticulate-fibrous, prolonged on one side into a triangular, acute, dorsally carinate point; partial inflorescences laxly paniculate-elongate; panicles divided into 6-7 branches, each arising from within a tubular spathe which resembles the primary spathes except for being smaller and more attenuate in the lower part, branches densely pilose-velutin-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ous in every part, with the peduncular part included in the respective spathe; flower-bearing branchlets alternate-distichous. Lower branches much larger than the upper ones, sometimes twice branched, bearing 10-12 and more flower-bearing branchlets. Flowering branchlets filiform, each arising from the axil of a thin, membranous, narrowly lanceolate-acuminate bract. Flowers in small glomerules, usually 2-4 together, alternate-spirally arranged, each with a minute bracteole. Calyx shortly tubular, $\frac{1}{12}$ inch in diameter, slightly longer than broad, obsoletely trigonous; segments acute. Corolla tubular for more than the lower half, divided into 3 broad deltoid teeth, 4-sulcate on the inner side. Stamens with their filaments united with the corolla-tube and forming a fleshy ring (at the mouth of the tube) which is provided with 6 small linear teeth; anthers dorsifixed, erect, small, shortly ovate, rotundate at both extremities; pollen exceedingly small, globose. Carpels forming a turbinate body, fleshy below, cartilaginous in the upper part, suddenly contracted into the style; stigma small, very shortly 3-lobed.

Fruit ovoid, sometimes globose-ovoid; mesocarp very small, with a few anastomosing-reticulate fibres; endocarp thinly parchment-like-woody, fragile. Seed free in the endocarp, $\frac{2}{3}$-$\frac{4}{5}$ inches long, $\frac{13}{24}$-$\frac{17}{24}$ inch broad, rotundate at both extremities; hilum at the base of one side; raphe occupying one side of the seed with 7-8 ramifications; albumen distinctly ruminate; embryo conical, basilar, slightly eccentrical.

HABITAT.—Brazil (Bahia, Pernambuco, Piauhy). Sometimes grown in Indian Gardens.

USES.—The berries, though bitter, are, either raw or boiled, eaten by the Indians; also the spadix is edible.

The leaves serve for a variety of purposes, such as thatch, pack-saddles, hats, etc., and in time of scarcity the young leaves are chopped up and given as fodder to horses and cattle.

The well-known vegetable wax is produced by the leaves of this palm. The young leaves, after they have been detached from the tree, are shaken, when each leaf yields about 50 grains of a whitish scaly powder, which is melted in pots over a fire; the wax then collects at the surface of the water. The Brazilians use the wax

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

occasionally to adulterate bees' wax; it is, however, mostly imported into Europe for manufacturing candles and for various other purposes.[1]

From the juice of the palm arrack and syrup are prepared. The roots are used medicinally as a substitute for sarsaparilla.

From the inner part of the trunk the natives prepare for home consumption a kind of farina.

The wood, especially of the lower part of the adult tree, is very durable, and lasts for many years, even when exposed to the weather; for this reason the trunk is used for almost every purpose, especially for all the framework of houses and the enclosures for cattle. The wood is not less useful in the manufacture of musical instruments.

CULTIVATION IN EUROPE.—This species is a stove palm. It is best cultivated in a compost of two parts of loam, one of peat, and one of sand. Perfect drainage and liberal supply of water are required.

II.—BORASSINÆ.

Spadix simple or little branched with thick cylindrical twigs; flowers markedly diclinous, dimorphic, invested with bracts, the male in 1-8 cincinni in grooves of the twigs; carpels 3, fully united, producing a 1-seeded drupe; leaves fan-shaped, induplicate. The only tribe is:

3. BORASSEAE.

DISTRIBUTION.—Tropical Africa from Guinea to Egypt and Natal, Mascarine Islands, Seychelles Islands, Coast of Arabia, East Indies, Philippines, New Guinea, Borneo, Sumatra.

The tribe comprises the following genera: *Pholidocarpus*, *Medemia*, *Hyphæne*, *Latania*, *Borassus*, *Lodoicea*.

KEY TO THE GENERA DESCRIBED BELOW.

Stamens 6.—Fruit by the abortion of 2 carpels unilocular with one central woody, ovate stone ... ... *Hyphæne*.

[1] Gissern, P. Die Amerikanische Carnaubapalme und die Gewinnung des Carnaubawachses. Seifens Ztg. Augsburg, 28 (1901) 581, 597-598.

Zimmermann, A. Die Wachspalme (*Copernicia cerifera*). P. flanzer, Tanga, 3 (1907), 191-195.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Stamens 8.—Fruit with 3 bony stones, or rarely by abortion with 1 or 2 ... ... *Latania.*

Stamens 6.—Fruit mostly with 3 stones; seed sinuate ... ... *Borassus.*

Stamens 8.—Fruit generally with one bilobed, kidney-shaped stone; seed bilobed ... ... *Lodoicea.*

HYPHÆNE, Gaertn. Fruct. I (1788) 28, t. 10, f. II (1791) 13, t. 82.

(From the Greek 'Hyphaino,' to weave, alluding to the fibres of the fruit.)

Benth. & Hook. Gen. Pl. III, 940.—Dalla Torre et Harms Gen. siph. p. 38.—*Douma* (Poir.) in Nouv. Duhamel ed. 2, IV (1801-9). —*Cucifera* Del. Fl. d'Egypte (1813), 145.—*Doma* Lam. Illustr. t. 900.—*Camariphes* Dill. Cat. pl. Schawii No. 143 (1738).—O. Kuntze Rev. Gen. II (1891) 728 (non *Pontedera*). Baillon Hist. des Fl. XIII, 324.

Unarmed except for the spines on the petioles. Stem cylindrical or ventricose, simple or dichotomously branched. Leaves in a terminal crown, orbicular or flabellate; segments ensiform, petiole concavo-convex, plano-convex or more rarely bi-convex; sheath short, open; ligule oblique or equilateral. Spathes cylindrical, incomplete; spadices diœcious, male and female similar; spadix branches alternate; flower-bearing branches subfastigiate; bracts semicircular, very densely imbricate; bracteoles membranous, bearded. Male flowers: Sepals linear-oblong, imbricate, connate at the base. Petals broadly ovate, obtuse, concave, imbricate, connate at the base into a short stalk. Stamens 6; filaments short, subulate; anthers linear, inserted at the bifid base. Rudiment of ovary O. Female flowers larger than the male, very shortly pedicellate. Sepals 3, ovate-orbicular, obtuse, imbricate. Petals a little smaller than the sepals, broadly ovate, obtuse, imbricate. Staminodes 3, connate into a membranous ring. Ovary subglobose, obscurely 3-lobed, 3-celled; stigmas 3, minute, sessile, terminal, at length excentric; ovule attached by a broad base to the side of the cell.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Fruit sessile or stalked, terete or obscurely lobed, often flat or intruded at the base and apex, 1-celled; stigma basal; pericarp fibrous, with a shining epidermis; endocarp woody, fleshy inside. Seed adnate to the endocarp, erect, ovoid or obovoid, intruded at the base; testa very hard, fuscous; raphe reticulately branched; albumen homogeneous, hollow; embryo apical.

Species at least 40.[1]

DISTRIBUTION.—All over tropical and subtropical Africa, Arabia, Western India.

INDIGENOUS SPECIES.

HYPHÆNE INDICA, Becc. in Aricoltura Coloniale, II (1908) fasc. III.—*Borassus dichotoma*, White in Graham Cat. of Plants of Bomb. (1839), 226. Mart. Hist. Nat. Palm. III, 318, n. 179.

NAMES.—Indian Doum Palm; Oka mundel (in Gujarat).

DESCRIPTION.—Stem dichotomously branched, similar in general aspect to that of *H. thebaica*. Leaves flabellate-multifid, suborbicular, measuring $3\frac{2}{3}$ feet from the apex of the petiole to the end of the central segments. Central segments rather much smaller and shorter than the intermediate ones, not inserted at the apex of the petiole, but at various heights on the stout rhachis which reaches almost half-way up the limb. Petiole about $3\frac{1}{3}$ feet long and about $\frac{4}{5}$ inch broad at the apex, regularly rounded on the under side, channelled on the upper side of the lower part and almost flattened near the apex, where it is plano-convex in a transverse section, armed with stout, uncinate, black spines with broad base. Ligule very irregular and asymmetrical, being much more developed on one side of the limb than on the other,

---

[1] On Hyphæne see :—

Beccari, O. Palmarum Madagascariensium Synopsis. Engl. Bot. Jahrb. Vol. 38 (1906), Beibl. No. 87, p. 1-41.

Beccari, O. Le Palme 'Dum' od Hyphæne e più specialmente quelle dell Africa Italiana. In 'Agricoltura Coloniale,' Anno. II, fasc. III. Firenze 1908, p. 137-183.

Carstensen, G. Doum Palms in India. Journ. Bombay Nat. Hist. Soc. VI, 271.

Dammer, U. Ueber Hyphæne. Engl. Bot. Jahrb., 30 (1901), 267.

Thiselton-Dyer. Flora of Tropical Africa, Vol. VIII.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

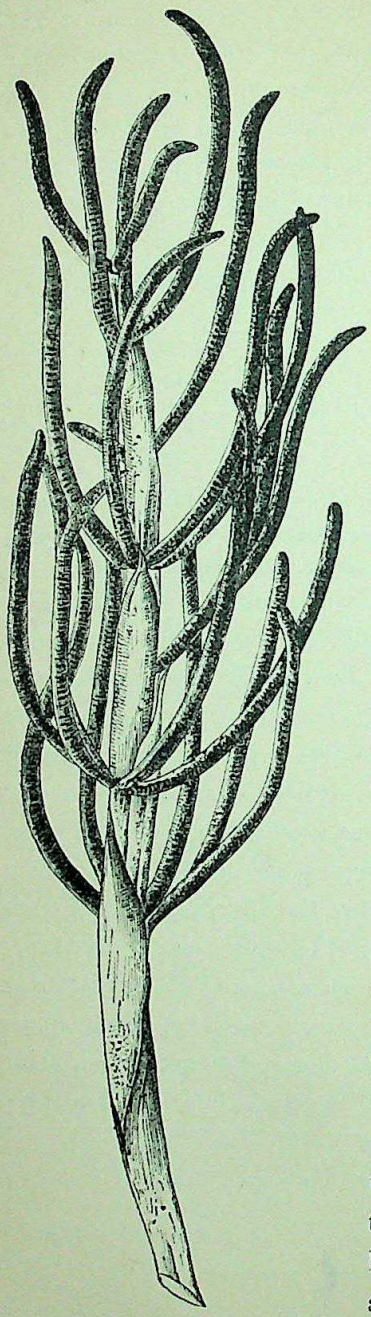


FIG. 24.—Male Spadix of *Hyphæne indica*.

margin subligneous, irregular and spinulose. Segments about 40; those of the middle portion of the sides are the largest and separate from each other about $\frac{2}{3}$-1 foot from the ligule; segments gradually narrowing into a very acuminate point which is divided for the distance of $3\frac{1}{5}$-4 inches into 2 secondary, rigid, very acuminate points; primary ribs of under surface rather stout and marked with small impressions; ribs of upper surface slightly weaker and finely punctulate-impressed under the magnifying glass.

Male spadix (Fig. 24) rather stout about $3\frac{1}{3}$ feet long (in Beccari's specimen) and about $1\frac{3}{5}$ inches in diameter at the peduncular part. Spathes tubular, ending at the apex on one side in a triangular, acuminate limb, covered all over with a dense woolly tomentum which is difficult to remove; branches of spadix about 6, the lowest 1 inch in diameter, bearing about 6 flowering branchlets digitately arranged, the next bearing 5, and the apical branch which is biconvex and only $\frac{1}{3}$ inch in diameter bearing only 2; the branches arise from their respective spathe. Branchlets $\frac{2}{3}$-$\frac{5}{6}$ feet long, $\frac{3}{8}$-$\frac{2}{5}$ inch in diameter, the axillary part tough and subligneous, no flowers at the base for the distance of about $\frac{2}{5}$ inch. Flowers 3

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"They differ from the dates," says Theophrast[1], "by their dimension, their shape and their taste; large enough to fill one's hand they are round and not oblong; being of yellow colour they contain a sweet and agreeable juice. They are not arranged in bunches like the dates, but grow isolated. The kernel is large and very hard."

The fruits were called 'ququ' in ancient[2] Egypt and it is not difficult to recognise in this word the root of Theophrast's κουκι (of the word κουκιόφορος).

Uses.—The leaves of younger plants are eaten by camels. The old leaves are put to many minor uses.

The trunk is used for making water conduits, "and it is possible," says Burkill, "that it might contain a little sago in just the same measure as the common Indian fan palm, enough to make it a famine food."

The thick fleshy-fibrous part of the fruit resembles gingerbread both in colour and taste, hence the palm is often known as the Gingerbread Tree.

The chief use of the palm is for the manufacture of buttons from the hard inner fruit-wall. It is also turned into beads for rosaries.

Cultivation in Europe.—The Doum Palm is difficult to cultivate. It grows best in rich sandy loam. Fresh seeds vegetate readily, but the young plants are of slow and precarious growth.

Cultivation in India.—Old specimens of the Egyptian Doum Palms may be seen in many a garden of India and Ceylon, and, as a rule, they are much better developed than the tree growing in Egypt. The climate seems, indeed, to exercise a great influence upon the development of this palm. When Haeckel saw the Doum Palm in Ceylon he was surprised to find it there under an aspect so altered that he could scarcely recognize them.

"Adaptation," he says, "to perfectly different conditions of existence have made the Doum Palm of Egypt quite another tree in Ceylon. The trunk is developed to at least double the thick-

[1] Theophrastus l. c. lib. IV, cap. 2, 7.

[2] Loret, V. Recherches sur quelques plantes. I. Les Palmiers d'Egypte. (Recueil de travaux relatifs à la Philologie et à l'Archéologie égyptiennes et assyriennes. t. II, p. 24.

Joret, C. Des noms de palmier (Revue des études grecques. Paris (1892), p. 417.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ness, much larger than in its native land; the forked branches are more numerous but shorter and more closely grown; the enormous fan-leaves are much larger, more abundant and more solid; and even the flowers and fruit, so far as my memory served me, seemed to be finer and more abundant. At any rate, the whole habit of the tree had so greatly changed in the hothouse climate of Ceylon that the inherited physiognomy of the tree had lost many of its most characteristic features. And all this was the result of a change of external conditions and consequent adaptation, more particularly of the greater supply of moisture which had been brought to bear, from its earliest youth, on a plant accustomed to the dry desert climate of North Africa. These splendid trees had been raised from Egyptian seed, and in twenty years had grown to a height of thirty feet." (A Visit to Ceylon, p. 180.)

ILLUSTRATION.—Not having at our disposal a good photograph of an Egyptian Doum Palm growing in India, we reproduce on Plate XXXV a photograph of some characteristic specimens which grow at Shaikh Hammed, near the ruins of Athribis and Dair-el-Abiadh in Egypt.

LATANIA, COMM., Juss. Gen. 39.

(After the vernacular name "Latanier" of *Latania barbonica*, Lam., now *Livistona chinensis*, R. Br.).

Gaertn. Fruct. II, 185, t. 120.—Jacq. Fragm. t. 8.—Mart. Hist. Nat. Palm. III, 222, t. 148.—Illustr. Hort, t. 229.—Baker Fl. Maurit, 380.—Benth. & Hook. Gen. Pl. III. II, 940, 118.

Of moderate height; leaves long-petioled, palmate-flabelliform; blade deeply laciniated.

DIŒCIOUS.—Flowers in distichously-branched axillary spadices, each branch sheathed by an obliquely truncate spathe. Male: Spikes cylindrical, with pits formed by the union of imbricating bracts, each pit containing a single flower; perianth-lobes imbricate; stamens 15-30, exserted; filaments connate at the base; pistillode a triquetrous column or of 3 or more subulate processes. Female: Bracts toothed on their outer edge, combined in pairs to form a cup for each flower; flowers fewer than in the male spikes; staminodes forming a toothed cup; ovary 3-celled; stigmas 3, distinct.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Fruit a drupe, containing 3 or, by abortion, 1-2 pyrenes: mesocarp succulent; pyrenes convex and sculptured externally; seed with a testa which adheres completely to the endocarp; albumen homogeneous; embryo apical.

Species 3.

DISTRIBUTION.—Mascarene Islands; generally introduced in Indian gardens.

CULTIVATION IN EUROPE.—The species of Latania are very handsome stove plants. They grow well in a compost of two parts of rich loam and one of peat, to which may be added a small quantity of sand. Perfect drainage is required. Propogation is effected by seeds. These are sown in a compost similar to that just mentioned, and placed in a moist, gentle heat.

LATANIA COMMERSONII, Gmel. Syst. II. 1035; Bory de St. Vinc. Voy. dans les isles de l'Afrique; Mart. Hist. Nat. Palm. III. 223, t. 148, fig. 4. t. 154, 161, fig. 2, t. W; Baker Fl. Maurit. and Seych. 381.—*L. plagæcoma*,——Comm. Mss. et Palmarium Vol. t. 26, 27, 28; Aub. Pet Thouars Mèlanges de Bot., Observat. sur les Plant. des îsles d'Afr., 51.—L. *rubra* Jacq. Frag. bot. 13, n. 49, t. 8; Willd. Spec. Plant. iv. 2. p. 878, n. 1; Spreng. Syst. Veg. ii. 623, n. 1.—*Cleophora lontaroides*, Gaertn. Fruct. —II. 185, t. 120, fig. 1.

NAMES.—Commerson's Latania; Latanier; Latanier rauge; Latanier de l'îsle de Bourbon.

DESCRIPTION.—Palm 40 feet high. Petiole 4-6 feet long, slightly tomentose, the margins smooth, spiny in young plants; blades 5-5½ feet long, dark green above, paler beneath; segments lanceolate, acuminate, 2 feet long, 3¼-3½ inches broad, their margins entire, spiny in young plants; veins and margins tinged with red. Male spadix 3-6 feet long, with 9-16 branches; spikes 7-10 inches long, ¼-⅓ inch broad, arising in clusters of 4-20 from the end of the branch within the mouth of the spathe. Perianth ⅙ inch long; margin of segments fringed; stamens 28-32; pistillode pyramidal-trigonous. Female spadix 3-6 feet long, with 8 or more branches, each bearing 3 spikes; free portion of bracts deltoid. Fruit a drupe, globose, 1½-1¾ inch in diameter; pyrenes obovoid, 1⅙-1½ inch long, marked with numerous ridges which pass from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Fig. 25.—A young specimen of *Latania Commersonii*, Gmel.

the base to the apex and then curve down again, a central ridge always most prominent; seed with a light brown testa.

HABITAT.—Mauritius, in various parts of the island, but not abundant; Seychelles (not indigenous); Bourbon.

Cultivated in most European conservatories and in many Indian gardens.

USES.—The fruit is eaten by the Negroes, but it has a rather disagreeable flavour. The leaves are used as thatch.

ILLUSTRATION.—Plate XXXVI shows a well developed specimen of this species growing in the Royal Bot. Gardens of Peradeniya. The photograph was taken by Mr. Macmillan.

LATANIA LODDIGESII, Mart. Hist. Nat. Palm. III. 224, t. 161, fig. II, 10-14; Baker Fl. Maurit. and Seych. 381.—*L. glaucophylla*, Hort.—

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Cleophora dendriformis, Loddiges in Cat. plant. hort. proprii in Hackney prope Lond.

NAME.—Loddiges' Latania.

DESCRIPTION.—Trunk 50 feet high. Petiole 3-4½ feet long, tomentose, the margins entire in the mature, spiny in the young plant; blade 3-5 feet long, very glaucous; the primary veins beneath slightly tomentose, and tinged with red, especially in young plants; segments 2 feet long, not quite 3 inches broad, unequally acuminate, the edges spiny in young plants.

Male spadix 5½ feet long, with 8-12 branches; spikes 1-08 inches long, ⅜—$\frac{7}{12}$ inch broad, arising in clusters of 3-9 from the end of the branches on a level with the mouth of the spathe. Perianth ⅜ inch long; segments not fringed; stamens 16-20, or more; pistillode of 3-5 grooved filaments nearly as long as the stamens. Female spadix 3½-4 feet long, with 5-6 branches, each bearing 1 or 2 spikes.

Fruit a drupe, obovoid or pyriform, trigonous, 2½ inches long, 1¾ inch broad; pyrenes elongate-obovoid, faintly mucronate at the apex, 1¾-2¼ inches long, ¾-⅚ inch broad, with a central ridge along the convex face with tree-like branching in the upper third, the inner surface furnished with a central crest, usually for only a part of its length. Seed with a dark brown testa.

HABITAT.—Mauritius, on Round Island, Flat Island, and Coin de Mire; introduced on the main land.

ILLUSTRATION.—We reproduce on plate XXXVII a photograph of *Latania Loddigesii*, taken by Mr. Macmillan in the Roy. Bot. Gardens of Peradeniya. The stem is covered, almost from the base, with the bases of fallen leaves.

LATANIA VERSCHAFFELTII, lemaire, Ill. Hort. VI, t. 229.[1]—*L. aurea*, Duncan, Cat. Hort. Maur. 52.

DESCRIPTION.—Trunk 40 feet high; petiole 5-8 feet long, densely tomentose, with entire, orange margins, spiny in young plants; blade pale green, 4½-5 feet long; segments 2½ feet long,

1 Cf. U. Dammer: Latania Verschaffeltii, Lem. Gard. Chron. ser. 3, 1902, vol. 31, p. 97-98.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

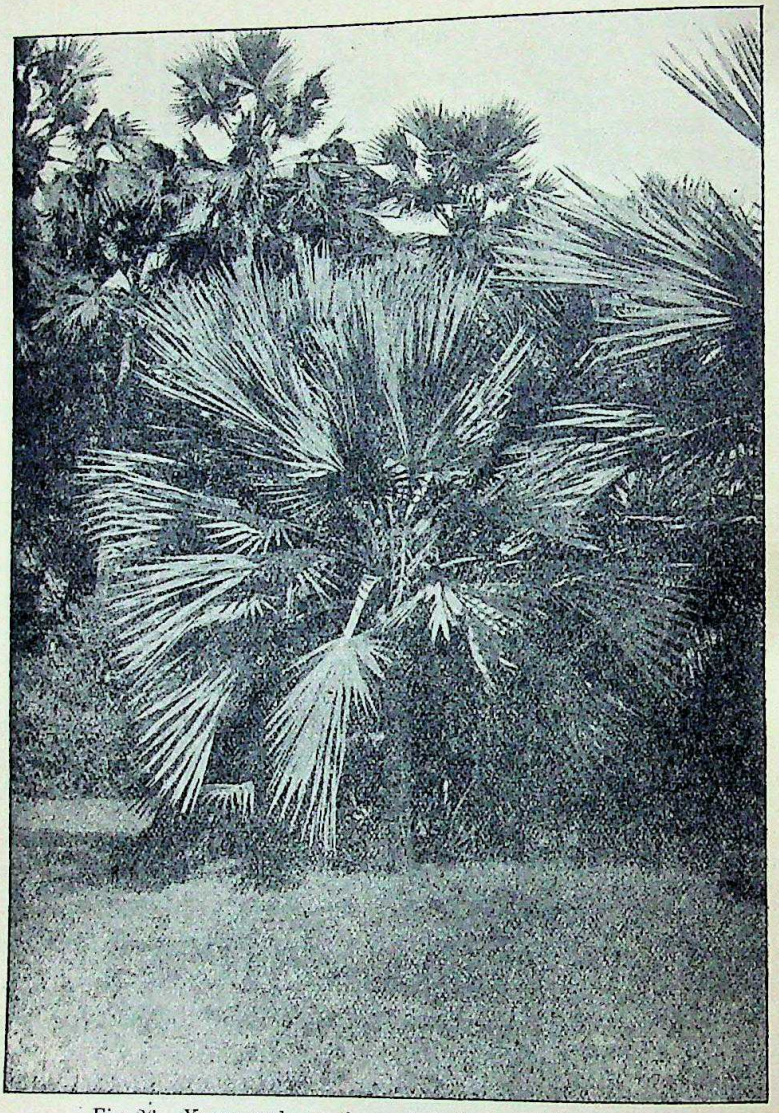


Fig. 26.—Young male specimen of *Latania Loddigesii*, Mart. From between the leaves rises the male spadix.

above 2 inches broad, acuminate, the entire margins and veins beneath slightly tomentose.

Male spadix 4-8 feet long, with 5-10 branches exceeding the spathes in length; spikes $1\frac{1}{4}$-2 feet long, $\frac{3}{8}$ inch broad, arising singly or in clusters of 2-3 on each branch; perianth $\frac{1}{12}$-$\frac{1}{4}$ inch long; stamens 20-30; pistillode a trique trous column, shorter than the stamens. Female spadix 3-5 feet long, with 1-4 branches

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bearing usually solitary spikes; staminodes forming a minute cup with 6-8 teeth.

Fruit a drupe, obovoid, slightly trigonous, 2 inches long, $1\frac{1}{2}$ inch broad; pyrenes oblong, $1\frac{1}{3}$-$1\frac{3}{4}$ inch long, $\frac{5}{6}$ inch broad, the convex surface marked by many hard prominences and a median ridge continued from the base to form a prominent apical crest and thence passing a short way down the inner face and ending abruptly; on each side also a deep groove separates the apical crest from a sharp process, whence one or more ridges run downwards. Seed with a light brown testa.

HABITAT.—Rodriguez; abundant over the island.

CULTIVATION IN INDIA.—This palm is of slow growth in this climate, but bears full exposure well.

USES.—Of the beautifully marked wood walking sticks are made.

BORASSUS, Linn. Gen. Nat. 1220.

[From the Greek 'Borassus,' the cover surrounding the palm-fruit; 'Bora,' food for animals; according to Brande 'Borassus' means the skin of the date, whilst Hamilton states that it means the spathe common to most palms.]

Gaertn. Fruct. I. 21, t. 8.—Roxb. Corom. Pl. I.—71-72.—Kunth Enum. Pl. III, 221.—Mart. Hist. Nat. Palm. III, 219, t. 108, 121, 162.—Griff. Notul. III, 167.—Kurz For. Fl. II, 531.—Drude Bot. Zeitg., 1877, 635, t. 5.—Luers. Botan. II, 338.—Hook. Fl. Brit. India, VI, 481.

A very tall dioecious palm; trunk stout, unarmed. Leaves terminal, fan-shaped, plicately multifid, sides of lobes induplicate in vernation; petiole spinous; ligule short. Spadix very large, interfoliar, simply branched; peduncle sheathed with open spathes, male with stout cylindric branches, that are densely clothed with closely imbricating bracts, enclosing spikelets of flowers which hence appear as if sunk in cavities of the branch; female spadix sparingly branched, bearing few scattered solitary flowers. Male flowers biseriate in small scorpioid spikelets enclosed in the bracts, secund; perianth glumaceous; sepals and petals 3 each, imbricate; stamens 6, pistillode of 3 bristles. Female flowers larger, globose;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

perianth fleshy, greatly accrescent in fruit; sepals imbricate; petals convolute; staminodes 6-9; ovary globose, entire or 3-4-cleft, 3-4-celled; stigmas 3; ovules basilar, erect. Fruit a large subglobose drupe with 1-3 obcordate compressed pyrenes; pericarp thinly fleshy; stigmas terminal. Seeds compressed, quadrate, top 3-lobed; testa adherent to the pyrene; albumen equable, hollow; embryo apical.

Species 1.

BORASSUS FLABELLIFER, L. Sp. Pl. 1187; Hook. Fl. Br. Ind. VI, 482; Trim. Fl. Ceyl. IV, 336.—B. Flabelliformis, L. Syst. Veg. ed. 13,829 —Thw. Enum. 329; Roxb. Cor. Pl. I, 50, t. 71, 72; Fl. Ind. III, 790; Griff. Notul. III, 167; Mart. Hist. Nat. Palm. III, 221, t. 108, 121, 162; Kunth. Enum. III, 222.—Brand. For. Fl. 544.—Kurz. For. Fl. II. 529.—*Borassus tunicata*, Lour. Fl. Cochinch. ed. Willd., p. 760.—*B. aethiopum* Mart., l. c. 221.—*Lontarus domestica*, Rumph. Herb. Amb. I, t. 10; Ham. in Mem. Wern. Soc. V, 314; Gaertn. Fruct. I, 21, t. 8.—Rheede Hort. Malab. I, t. 9, 10.

NAMES.—Palmyra Palm, Brab Tree[1] (English); Tala, Tal, Trinaraja (Sansk.); Tal, Tar, Tarka jhar (Hind.); Tad, Tamar (Mar.); Tal, Talgachh (Beng.); Tan (Burm.); Taark Dizaar (Deccan); Tala-wruxium (Tanjore); Tal, Tal gaha (Singh.); Panay, Panaymaram [the tree], Arn Panay [the male tree], Purn-Panay [the female tree], Vadaly [the young tree], Oly [the leaf], Panang-kai [the fruit], Nonku [the kernel] (Tamil); Pootpady, Poottaly, Ponthy, Talam (Poetical Tamil); Tatechutta [the tree], Potutadu [the male tree], Pentetadu [the female tree], Bonda [the young tree], Tatikaya [the fruit], Tataku [the leaf], Nungu [the edible part of the fruit] (Tel.); Lontar (Malay); Rontal, Sualan (Java); Coli (Timor); Murume (Cochin China); Panuguera, Palmeira macha brava (Portug.); Jager-Boom, Weingeevende Palm-Boom (Dutch); Palmyra Palme (German); Rondier (French).

DESCRIPTION.—Trunk attains 100 feet in height and 2-3 feet in diameter, black, swollen above the middle and again contracted upwards, while young covered with dry leaves or the bases of petioles, old stems marked with the black narrow scars of the

[1] The name 'Brab,' commonly used in Bombay, is derived from the Portuguese 'brava'. 'wild palm.'

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

petioles, near the ground with a dense masse of long rootlets. Leaves 3-5 feet in diameter, palmately fan-shaped, rigidly coriaceous, many-cleft into lanceolate or linear 2-fid lobes; segments 60-80, shining, folded along the midrib, with spinulose margins; petiole 2-4 feet long, stout, semiterete, edges with hard horny spinescent serratures; ligule short.

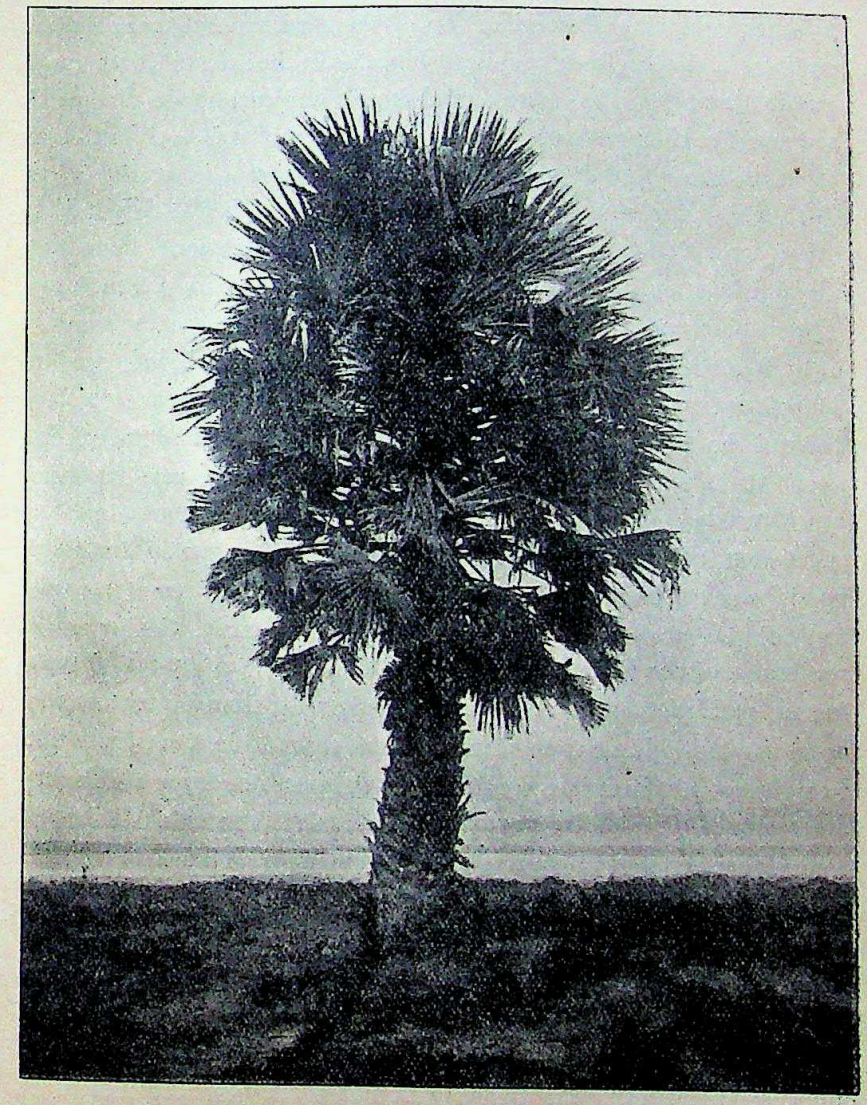


FIG. 27. Young Palmyra Palm (taken on the sea shore at Mahim, Bombay Island).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Male spadix simply branched, sheathed with many imbricated spathes, each vaginated at the base, but soon splitting into a long, concave, pointed, boat-like sheath, in substance very strong and fibrous; when young they are covered with a soft, downy, rust-coloured substance; (sometimes in the lower axil of the sheaths there is a bundle of smaller sheaths, forming a spathe like that now described, but without spadix). The superior 4 or 7 sheaths embrace each ramification of the spadix, each ramification ending in 1-3 cylindric spikes, beautifully imbricated with innumerable bracts. The lower and shorter ramifications of the spadix universally composed of 3 spikes spreading from each other in the same plane and distant from each other at the points about 3-5 inches, the middle one extending from 2-3 inches beyond the other two. One or two of the higher ramifications sometimes divided into only 2 spikes and occasionally consisting of one only. These spikes are 12-15 inches long, while the lower ones measure only 9-12 inches. The bracts of the spikes are broad, wedge-shaped, retuse, adhering by their lateral margins to the keel or back of the next above, forming a cavity for a second spikelet of about 10-12 small, sessile flowers; seldom more than one expanded at a time, beginning with the uppermost, so that there is a long succession of them. Flowers of spikelets arranged in 2 vertical opposite rows, beautifully serrated into each other, each spikelet forming an arch with its convex side undermost, the common receptacle of the little florets forming the other. Flowers appearing in parallel nearly straight rows, running from bottom to top, or in parallel oblique rows running from right to left, or from left to right round the spike, according to the position from which they are viewed. Sepals narrowly cuneate, tip truncate, inflexed. Petals shorter, obovate spathulate. Stamens 6; filaments connate with the corolla into a stalk; anthers large, subsessile, oblong.

Female spadix simple; spikes terminating the branches of the spadix; the lower end of the spadix is a smooth stem, sheathed with several spathes; spikes enveloped in bracts which cover all parts of it and rise over the flowers to the number of 8-12; a barren bract encircles the spadix, just below where the flowers commence to rise from it, and the upper end of the spadix, extending to a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

length of 2 or 3 inches beyond the flowers, is also enveloped by these bracts. Flowers larger than the male flowers, 1 inch in diameter, globose. Sepals fleshy, reniform, imbricate; petals smaller, convolute; staminodes 6-9. Ovary subtrigonous, (3-4-celled) celled; stigmas sessile, recurved.

Fruit a drupe, when young pretty distinctly trigonous, but when old, the pulp round the pyrenes so swells as to give the fruit the appearance of an almost perfect globe, 6-8 inches in diameter, seated on the greatly enlarged perianth. Pyrenes 3-1, obcordate, fibrous outside; endosperm horny, hollow; mesocarp fleshy and fibrous.

GERMINATION.—When the nuts begin to germinate, the space within the kernel fills up with a cream coloured substance of the consistency of cheese[1]. From this the root of the germ or young plant protrudes, through that end of the nut which was attached to the spadix, the body or actual stem of the plant following, until the two first leaflets are thrown up with the shell of the nut attached. All these parts are, when very young, beautifully incased in an entire leathery substance like the sheaths of the spadix. These seedlings are called 'dantalas' or 'kelingoos'.

Each of these little trees has 1-4 rootlets attached to it. The lower part of the stem, where those roots are attached, resembles much that end of a carrot, parsnip or radish to which the crop is attached; and indeed the plant altogether looks very like an inverted long parsnip.

These dantalas, which are found beneath the surface, are about 1 inch thick at the lower part and taper off to a mere point, being 12-15 inches long. A slit or groove runs from near the bottom

---

[1] For the chemical aspect of the process of germination, see: Gatin, C. L., Contribution à l'étude chimique de la germination du Borassus flabelliformis L., in Bull. Soc. Bot. de France (1905), 4th series, vol. v., pp. 558-561.

By the same author: Nouvelle contribution à l'étude chimique de la germination du Borassus flabelliformis, L. in Rev. Gén. Bot. Paris, 18 (1906), 481-483.

Besides: Recherches anatomiques et chimiques sur la germination des palmiers. Paris, 1906, pp 307-308.

Transformation diastasique du mannose en glucose au cours de la germination du Borassus flabelliformis, L., in Bull. Soc. Bot. de France, vol. 55 (1908), pp. 383-386.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to the top. This groove is nothing else but the folding inwards of the first leaf, which composes nearly the entire thickness of the stem. If it be cut across, it will be found to enclose the inner leaves in a small oval pipe about $\frac{1}{8}$ inch in thickness.

When these dantalas are about 9 to 12 months old, they have usually two leaves just issuing from the surface. These are from 1-1½ inches in breadth, and from 2½-3 feet in length, having only four or five folds in each leaf. When the leaves issue from the ground, no part of the stem is seen, but a succession of leaves goes on, increasing in breadth and thickness, for 6 to 7 years. The stem close to the ground is then perhaps as stout as ever it will be; indeed in many cases stouter, as these trees harden and compress by age. (Ferguson.)

GROWTH OF PALMYRAS.—On this subject we refer to:

Jackson, A. B.—The rate of growth of Palmyras, Indian Forester, Vol. 35, p. 394.

Lushington, A. W.—The growth of Palmyras. Ibid., Vol. 35, p. 573, Vol. 36, p. 362.

Hole, R. S.—The growth of Palmyras. Ibid., Vol. 35, p. 632.

HABITAT.—A native of tropical Africa. Cultivated in the Indian Archipelago, the Trans-Gangetic Peninsula, Ceylon, South and Central India, Bengal and Lower Sind. In North-West India as far north as Aligarh and Shahjehanpur. Isolated trees in gardens in Rohilkhand and the Upper Ganges, Doab, as far as Saharanpur. Also on both sides of the Persian Gulf, attaining there about the same latitude as in North-West India, *i.e.*, 30° N. L. Immense groves of it are found on the Malabar coast, extending from Cape Comorin through Travancore, Calicut, Goa, and the Bombay Presidency, on through Gujarat and up some distance on the banks of the Indus. But what are emphatically called the Palmyra regions may be included in a line extending along the Coromandel coast from Cape Comorin to Madras including the northern portion of Ceylon and from Madras all along, taking in a considerable belt of the coast between that and Point Palmyras, and then passing up to Gya on the 85th degree of E. L. and nearly 25° of N. L. After that the line should be carried on about due east until it reaches Ava, below which on the banks of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Irrawaddy, there are immense groves of this Palm. From Ava the line should pass down south-east, through the Malayan Peninsula and the Indian Archipelago, including Sumatra, Borneo, Celebes, Flores, and the Molucca Isles.

The Palmyra Palm is found in various parts of the mountain district of Ceylon, including the vicinity of Kandy and of Badulla at elevations of 1,680 and 2,450 feet respectively, having a mean annual temperature of about 74° at the former and 71½° at the latter.

Although immense groves are found on the banks of the Irrawaddy, from the sea coast up to nearly as far as Ava or Amarapura in Burma, and as far inland as Gya in Bengal, and in isolated patches all round and through Ceylon, still the most congenial places for their favourable development will be found in low sandy plains scarcely elevated above the level of the sea, and where they are exposed to the burning sun, and the force of at least one of the monsoons. Such are Jaffna, with the surrounding islands, and other portions of the northern province of Ceylon, the district of Tinnevelly, with portions of the Madura Collectorate, portions of the Madras and Bombay Presidencies and of the Indian Archipelago.[1]

FLOWERS.—In March and April; fruit ripens in April and May and is matured in July and August.

THE PALMYRA PALM AND ITS GUESTS.—The tree is well adapted for sheltering animals and hence they are resorted to by birds at night, and by rats, squirrels, mungooses, monkeys, etc., during the day time. When the leaves of a tree are undisturbed, the number of bats sometimes occupying it is incredibly great.

A great number of epiphytical plants find support and nourishment in the axils of the leaves. A very interesting union is that formed by the Palmyra and several species of Ficus. The birds which feed upon the fruit of Fig trees "drop the seeds in the alæ (axils) of the leaves, where they grow and extend their roots, etc., so as in time to embrace the parent Palmyra, except its upper

[1] Ferguson, W., Description of the Palmyra Palm of Ceylon. Colombo 1888, p. 11.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

parts. In very old ones the top thereof is just seen issuing from the trunk of the Banyan, as if it grew from thence, whereas it runs down through its centre, and has its roots in the ground, the palm being the older. For such the Hindoos entertain a religious veneration saying it is a holy marriage instituted by Providence." (Roxburgh.)

USES.—Every part of the Palmyra Palm is turned to account in some way or other.[1] By far the most important aspect of this tree is as a source of food.

1. The juice or toddy.—This is almost as famous for its use as notorious for its abuse. The juice can only be obtained after the young flowering branches have made their first appearance. The trees do not generally bear until 12 to 15 years after they have been planted, and only then can the male be distinguished from the female trees. Ferguson, who examined trees of both sexes most minutely before the spadices were to be seen, could detect no peculiarity in shape, size or colour by which to distinguish them. Were it possible to do so, it would be of the utmost importance to extensive cultivators of this useful palm. When the trees have arrived at the age mentioned, the spathes begin, in the months of November and December, to protrude from amongst the leaves near the top of the trees, which have then attained heights varying from 8-25 feet. The next natural course would be the bursting of these spathes, and the production of fruits, but in many cases the laws of nature are herein completely thwarted, for the toddy drawers now step forward and attack the trees of both sexes, but oftener the males, for the extraction of toddy,—the life juice of the inflorescence. In the various written descriptions of the ways in which this is done, the information is often contradictory and unsatisfactory. Some writers, and recent ones too, state that the fruits of the trees are pierced for the purpose. Others say, that a hole is bored in the body of the tree in which a plug is inserted, to be removed when toddy is wanted. In this conflict of opinions we consider it much safer to follow an experienced guide.

[1] Grisard, J., Produits et utilisation du Rondier, in Rev. Cult. Colon. Paris, 9 (1901), 110-114.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Ferguson gives an excellent description of the whole process from personal observations made in Ceylon.

When the proper season arrives, which is in November and December, the too frequently degraded and drunken toddy-drawers are seen and heard busy at work in the Palmyra groves throughout the Peninsula of Jaffna. Their practised eyes soon fix on those trees that are fit for the 'scalping knife', and if they have not dropped the footstalks of the leaves, the first operation, if the trees are valuable, is to wrench these off. This done the toddy-drawer, armed with his leathern protector for his breast, his raceme-batten of wood, his small thongs, straight and crooked knives, with the 'side leather pouch' to contain them, procures a piece of tough jungle vine, or a strip of the footstalk of a fresh leaf of a young Palmyra or Cocoanut tree, which he thoroughly twists, and then converts it into a sort of loop of such dimensions as to admit of his feet getting through to a span large enough to allow them clasp the tree: This done he puts his feet in this thong, stands close to the tree, stretches himself at full length, clasps it with his hands, and pulls his feet up as close to his arms as possible; again he slides up his hands, and the same process is repeated, until, by a species of screw process, he ascends to the summit of the tree. When the trees are high, some use hoops of the same material, large enough to encircle both the tree and the toddy-drawer who slides it up the tree, so that it is always a support to the body while the climber is in the act of taking a fresh grasp.

Arrived at the summit, amongst the leaves, the climbing apparatus is laid across a leafstalk, and the pruning and phlebotomy commence. One or two of the lower leaves are left as a support to the toddy-drawer until the operation is completed. He then draws his crooked knife, which, on a small scale, a good deal resembles a reaping hook, and rids the tree of all the accumulated dirt, such as old leaves, the net work which supports them, and, if an old tree that bore fruit before, the stumps of the fruitstalks. Then all the leaves are cut off, excepting 3 or 4, and the young top bud of the tree. Besides the removal of all these, the crooked knife is now used in shearing off the outer covering of that part of the tree

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

from which spring the leaves and the racemes. These latter are supported during this operation, by being tied up by several thongs to the footstalks of the uncut leaves. The pruning having been completed, all or most of the spathes are effectually encompassed from end to end by thongs, to prevent the membrane which covers the inflorescence from bursting. The racemes thus tied are then beaten and crushed between the wooden battens to wound them, and to hurry on the flow of toddy. This done and the spathes being secured to stalks of the remaining leaves, the toddy-drawer descends. The operation of beating and crushing takes place for 3 successive mornings, and on each of the 4 following a thin slice is cut from the points of the racemes, to encourage the flow of sap and keep them from bursting. On the eighth morning a clear sweet liquor begins to flow from the wounded spadix, which is indicated by the 'Toddy Birds' and crows fighting and chattering amongst the trees. The toddy-drawer then ascends with a chatty or toddy-receiver stuck to his belt behind. He places the ends of the spadix in these, and when secured leaves them till evening, when they are found to contain quantities of this liquor. The operation of attracting the juice is repeated every morning and evening, or in the mornings only, until the whole of the spadix is sliced away.

The trees are drained in this way for several months of the year, but if the operation is repeated on the same tree for 3 successive years, without allowing any of the buds to burst naturally, the trees are said to die. A spadix continues to give toddy for about 5 months, at the rate of 3 or 4 quarts a day, and while seldom three spadices are yielding toddy on the Cocoanut tree, seven or eight will yield juice at once on the Palmyra Palm. An expert climber can draw the toddy from about 40 trees in a few hours.

In Jaffna a distinction is made between 'toddy' and 'sweet toddy'. The former, called by the Tamils Culloo, is the juice when it is allowed to ferment, which it does in a few hours after sunrise. Sweet toddy, called Carupaner, is obtained by sprinkling the inside of the toddy-receiver with lime or chunam, which keeps it from fermenting.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The toddy procured from the male Palmyra tree is said to be sweeter than that from the female. The latter, besides, yields only about half as much sap as the male.

Many trees are encircled near the ground with a strip of tar, etc., to prevent ants and other vermin getting up and making a decoction of the toddy in the chatties.

It is not a little amusing to notice the various comparisons to which this juice has given rise. Sir W. Jones compares it, fresh from the tree, to Poubon water, fresh from the fountain, or to the best mild champagne; Malcolm, the American, naturally enough associates its taste with that of his native cider; while Johnson, a traveller in Abyssinia, ranks it no higher than ginger beer. It is possible it bears a resemblance to all these, and indeed a good deal of the Ceylon ginger beer is made from toddy. The result of partaking of toddy in the early morning is generally a listless drowsy sensation.

2. *Sugar or Jaggery*[1].—It appears, says Ferguson, that in the time of Menu, upwards of 4,000 years ago, the Hindus knew how to make sugar from the flowers of the Madhuca tree (*Bassia latifolia*); and this being the case, there is great reason to suppose that sugar was made from some of the palm-trees at a much earlier period. Sugar candy is alluded to by Megasthenes under the name of 'Indian stone,' and to this day the crystals formed either from jaggery or the juice of the cane are called 'Catcandu, or stone sugar. The common Indian name for the finer sorts of sugar, 'Cheenee' has been supposed to point to the Chinese origin of the production.

The usual process of making jaggery, as persued at Jaffna, is exceedingly simple. The sweet toddy is boiled until it becomes a thick syrup; a small quantity of scraped cocoanut kernel is thrown in that it may be ascertained by the feel if the syrup has reached the proper consistency and then it is poured into small baskets of Palmyra leaf where it cools and hardens into jaggery. In these small plaited Palmyra baskets it is kept for home consumption,

[1] These terms are variously derived from the Sanskrit 'Sakar,' Arabic Shakar whence the Latin 'Saccharum', and the English 'Sugar.'

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

sent coastwise, chiefly to Colombo, or exported beyond seas to be refined. About 3 quarts of toddy suffice for boiling into 1 lb. of jaggery. The juice of the Palmyra is richer in saccharine matter than that of most other palms, in consequence, perhaps, of the tree more generally growing in dry sandy soil and in a dry climate.

To make 'Vellum' or crystallized jaggery, which is extensively used as a medicine, the process is nearly the same as for the common substance; only the syrup is not boiled for so long a period. The pot which contains it is covered and put aside for some months, at the end of which period the crystals are found in abundance.

Jaggery, besides being exported in large quantities, forms a considerable portion of the food of the poorer classes in India and Ceylon. The sweetness of Burmese bread seems to depend on the use of toddy-juice to raise it.

Amongst a variety of purposes to which it is put, is that of being mixed, together with whites of eggs, with lime from burnt coral or shells. The result is a tenacious mortar, capable of receiving so beautiful a polish that it can with difficulty be distinguished from the finest white marble.

It is stated that palm sugar, which is chiefly the produce of the Palmyra tree is more granulated and higher priced than that obtained from the cane. Small round cakes of jaggery were used formerly and to some extent still pass as currency in the Tinnevelly district.

3. *Vinegar.*—Large quantities of vinegar are made in Ceylon from toddy. It is prepared in the following way:—A glazed earthen jar is buried three-fourths its depth in the earth, in a spot exposed to the full influence of the sun. A quantity of Palmyra or Cocoanut tree toddy is daily thrown into the jar, until it is nearly full, when the mouth of it is carefully clayed up. The fermenting process immediately commences and continues for some months. At a certain stage of the process, which is ascertained by removing the cover and testing the quality of the vinegar, quantity of burnt paddy is thrown in, which in the course of a few days change the watery colour of the fluid to that of pale brandy. The vinegar is then fit to be bottled. It is used

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

extensively for pickling gherkins, limes, the cabbage from the heart of the Cocoanut and Palmyra trees, and several other substances.[1]

The following particulars regarding the preparation of vinegar apply to the Madras Presidency[2]: The producers are the toddy-shopkeepers, and they convert their unspent toddy into vinegar in either of the following ways. The toddy is placed in a clothed earthen pot and kept there till fermentation is complete and the liquid has become sour. The pot is either kept above ground for a month or two, or is buried underground for three or 4 months or more, and then taken out. The longer the pot is kept closed and underground, the better the quality of the vinegar. In either case pure vinegar is obtained when the pot is opened and the sediment has been removed. Vinegar is also made by heating fermented toddy either by fire or by exposure to the sun. It is procured in a shorter time by this method, but the quantity is less than by the slow or natural fermentation. The vinegar thus obtained is, however, used both for medicinal purposes and in cooking. There is no shop or bazar in Madras where country-made vinegar is specially sold, and the trade is not so extensive as that in either English or German vinegar.

4. Palm Wine or Arak.—If the toddy be distilled the result is palm wine (arak). "The extent to which the spirituous liquor is employed," says Watt, "may be judged from the fact that at one time the Bombay Government became so alarmed at the excessive consumption of arak in Surat that they ordered large numbers of this useful palm to be destroyed. In this connection it is interesting to observe that Fryer, who visited Surat in 1673, mentions that on drawing near the roadstead they saw groves of Brab-trees, from which the Parsis made a 'wine akin to toddy.' This wine the sailors drank, and the result was perpetual disturbances of the peace. The plentifulness of the toddy resulted in the district being overrun by 'soldiers and seamen of the Moors.'"

5. The Fruit.—Within the shell of the young fruit there is a jelly-like fluid which is eventually transformed and deposited

---

[1] Ferguson W. l. c. p. 29.

[2] Watt, G. The commercial products of India. London, 1908, p. 1111

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as a hard albumen. When the fruit is half-ripe (April-May), while the shell is yet soft, they are often torn off or cut from the tree, and stripped of the outer bark. The shell of it is then perforated with the finger, and then the soft kernel can be sucked up. It is pleasant to the taste and exceedingly refreshing; but too large a quantity of it ought not to be taken, for, according to Rumphius, it debilitates the stomach. The jelly and soft albuminous layers are sometimes cut into pieces and flavoured with sugar and rosewater.

The fruits, when ripe, vary in colour from a light gold at the end which is attached to the spadix, to brown and nearly black at the other. Some trees have all their fruits of a beautiful gold and others of a very dark colour, and these differences in their colour and other properties have induced the natives to give them various names. The fruits, when they fall ripe from the tree, are sometimes eaten raw, but are more generally roasted, and the scene exhibited at a roasting feast of Palmyra fruits, is in Ferguson's estimation one of the most purely Oriental that can be witnessed. "When at hand, the shade of an Illipe (*Bassia longifolia*), of a Margosa (*Melia Azadirachta*), or Tamarind (*Tamarindus indica*) is chosen; a fire is lighted on the ground, composed of Palmyra leaves, etc., and the party, men, women, boys and girls, squat around, sucking the pulp out of the fibres of each fruit as it is roasted, tearing them asunder with nails and teeth in the most approved and natural style, all appearing wrapped in the highest possible state of alimentive enjoyment."

The mesocarp of the ripe fruit is a soft, mellow, luscious, semi-saccharine and farinaceous matter, known as Palmyra pulp. The period during which the fruits are obtained being short and a greater number ripening than the inhabitants can consume, preserved pulp (called punatoo in Ceylon) is made in the following manner:—"Pandals (stages) are constructed within 4 or 5 feet of the ground, and on these Palmyra-leaf mats are spread; the ripe fruits are then taken, torn up, put into ola-baskets containing fresh water, and are there squeezed by the hands till the pulp with the water forms a jelly. Layers of this jelly are spread on the mats to dry; this process is repeated for 15 to 18 days, one layer being deposited

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

above the other until they amount to about 15 or attain to about half an inch in thickness. The mats are exposed in the sun to dry, being covered at night and protected from the rains and dews." The tough leathery kind of preserved pulp made from the remaining fruits gathered at the end of the season, is much inferior to the other, and is called Tot Punatoo. The pulp is preserved in ola-baskets or bags by being hung up in the smoke. It is generally eaten plain or mixed with gruel made from the pounded farina of the young Palmyra seedlings and with cocoanut kernel.

Rumphius'[1] graphic account of the way in which Punatoo is prepared, is well worth being quoted in this place: "In making 'Punata' more labour is required, for after the ripe fruits, which fall from the tree from July to September, have been collected, the stalks and the cups are twisted off with the hands; the outer rind is stripped off, and the peeled fruit are washed in water, and cleansed from the adhering fibres and earth; they are then pressed out, and rubbed for a long time with other limpid water, until all the yellow juice has been drawn out; this is sometimes repeated twice or thrice, lest the juice should be lost; and it assumes a thick consistency; and with a hooked stick they cleanse it from all the fibres of the shell; and then they prepare a machine made of sticks, which is here called Parra Parra, by the Malays Lante Lante, and in Malabar Pandel. On this machine they spread large palm mats from 14 to 16 cubits long, on which they then pour out the liquor so thick, that scarcely a leaf of the mat can be seen; they then leave it to dry for one day and on the next day they pour fresh juice, which is again left to dry, after repeating the same labour until this cake has acquired the thickness of three fingers; which labour is generally continued for 15 or 16 days; but these mats are folded up during night, and are covered with leaves to preserve it from cats and dogs, who are exceedingly fond of this cake. When this becomes as hard as cheese, it is cut into square pieces or cakes, and they raise them gently from the mats with a knife and place them in layers in baskets, and sprinkle the layers with water in which salt has been dissolved.

---

[1] Rumphius, G. E., Herbarium amboinense. Amstelod. 1741-1755, Vol. I, Cap. IX.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"And these baskets or sacks are placed on a three-legged stool, which they fasten by a rope to a beam, that for some days they may be impregnated with smoke; but this should not be done too much, lest the Punata should become bitter; they also place the ropes in such a manner, that mice cannot enter; and then this work is finished, and the Punata or Pœnata so often mentioned is prepared—and this they reserve for use during winter.

"The people of Maccassar prepare the fruit in a much more convenient manner, nor do they spend so much labour. When the juice has been only expressed, they pour it into large pans and mix it with the farina of rice, and thence prepare many kinds of food."

The seed within the albumen is also eaten, being sold in Bengal under the name 'talsans.'

6. Young seedlings (dantalas, kelingoos) as vegetable.—After the Punatoo, described above, is taken from the ripe fruits, the nuts are kept for future use. At a convenient season they are sown in 6 to 8 layers, under loose, sandy soil, thrown up in parts of the gardens or fields close to the dwellings of the natives. Planted in beds in this manner, there is, no doubt, a greater heat created in consequence of the fibre surrounding the nuts, &c., which induces them to grow more rapidly than otherwise and better for purposes of food. According to the 'Agricultural Ledger' about 50 fruits are planted to the square yard, and these may produce 100 and more dantalas.

These are taken up when they are two or three months old, the nuts cut from the points of the leaves, and then the seedlings are exported or eaten in various ways. "To keep these kelingoos for future use, they are deprived of the beautiful parchment-like sheath in which they are completely enveloped, and then dried in the sun. Those dried in this manner, before they are boiled, are emphatically called Odials, and those boiled after, are called Poolooc Odials. It is the Odials that are reduced to flour or meal of which the favourite Cool (of the Singhalese), or gruel is made. The kelingoos roasted, boiled, or cut into slips and fried like slices of Bread Fruit, are eaten by the natives and will be found in the bazaars of Colombo and elsewhere all the year round. In their dried state they seem to be chiefly farina with a few fibres running through them, and their taste is very astringent. It is of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Odials that the flour once so prized by the Dutch, according to Bennet, is made; though in these days [1850] we never hear of this substance being sent to the Cape of Good Hope or Holland. A substance called Putoó is made of the Kelingoo flour. To the meal is added a little water, into this are put prawns or small fish, scrapings of Cocoanut kernel, unripe jack fruit, etc. This mixture is put into an ola-basket which is placed on the top of a pot of boiling water, covered over with a chatty, and cooked by the steam. This is reckoned a great delicacy." (Ferguson).

In India the vegetable is eaten chiefly by Kolis and low-class people.

In a cheap year the gross value of a crop per acre at ordinary market rates would be about Rs. 1,800, rising in a dearer season to Rs. 3,000.

7. *Medicine.*—The juice of this plant is used as a stimulant and anti-phlegmatic. "Europeans, especially delicate females, in India, who are apt to suffer much from constipation, find a cup-full of this toddy, drank every morning at five o'clock, one of the simplest and best remedies they can employ. The Vytians prescribe it in consumptive cases." (Ainslie, Materia Medica.)

The root is considered cooling and restorative, as also the gelatinous contents of the unripe seeds. The ash of the spathe is given for enlarged spleen.

A useful stimulant application, called toddy-poultice, is prepared by adding fresh drawn toddy to rice-flour till it has the consistence of a soft poultice; and this being subjected to a gentle fire, fermentation takes place. This, spread on a cloth and applied to the parts, acts as a valuable application to gangrenous ulcerations, carbuncles, and indolent ulcers. The light-brown cotton-like substance from the outside of the base of the leaves is employed as a styptic for arresting hæmorrhage from superficial wounds. (Pharmacop. of India).

8. *Wood.*—The trees have to arrive at a considerable age before they are of use for timber; when a hundred years old, they are excellent. The heart of the tree is soft, but the outer wood is hard, heavy, and durable, consisting of numerous thick black vascular bundles. The weight of the solid foot is 65 lb., the value

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of P. 944. Pillars and posts for the verandahs of the houses, well-sweeps, etc., are made of this timber. Trunks split into halves, with the heart scooped out, are used as spouts for various purposes, but more especially for carrying away the water from the eaves of houses. The thick parts of the trunks are generally taken for rafters, the thinner or tops for laths. The trunks of young trees or the tops of old ones are often cut into pieces and placed where game is plentiful, as in the Patchelepalla district of Jaffna. The wild hogs and hares are very fond of the soft, white, spongy hearts of the logs, and in resorting to them to eat, are frequently shot by the natives. The dark outside wood of very old trees is used to some extent in Europe for umbrella-handles, walking canes, paper rulers, fancy boxes, wager-stamps, and other articles. It is well known in India that the female tree produces the best and hardest timber, and that that of the male is considered so inferior that, unless the trees are very old, it is never used. The juice is used in the preparation of cements.

9. *Leaves and Fibres.*—When the leaves are intended for thatch of houses, and for making fences for gardens and fields, they are laid flat on the ground in layers over each other and often with weights upon them to assist in flattening them. The thatch formed of these does not last so long nor is it so handsome as that made from the plaited cocoanut leaves. Palmyra thatch, when laid on well, lasts for two years, but being so plentiful and cheap, the leaves are generally renewed yearly.

In India as well as in Ceylon the leaves are extensively used for manuring the rice fields. The fan parts are put into the ground till they rot off; this is found to be an excellent manure, giving a quantity of silicious and other matter to the soil.

Mats of various sizes, used instead of carpets on floors, for ceiling and for many other purposes, are made of the Palmyra leaves. Ola bags are also formed and are useful for purposes where strength of texture is not an object. Even water baskets for raising water are made of the leaves. They are circular on the top but taper down in a triangular form to the bottom which is a point. They are occasionally woven into hats and caps. At Diamond

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Harbour near Culcutta, hats have for many years been made of this material and sold to the European sailors who visit Calcutta.

Umbrellas made of these leaves, though doubtless very good for protection from sun and rain, are rather inconvenient, as they are made in such a way that they cannot be folded. They have a handle and are about the size of an ordinary umbrella when expanded. Single leaves are occasionally used as a protection from the sun when the weather is very hot.

A great variety of fans are made of the leaves; some are nicely painted and covered with pieces of transparent and colourless talc, others are made to fold into a small compass, and again to expand, when wanted, into an almost perfect circle.

Several kinds of fibre may be obtained from the Palmyra Palm. A loose fibre which surrounds the base of the leaf-stalk; a fibre which may be separated from the leaf-stalks; a fibre called tar, which may be prepared from the interior of the stem; a fibre or coir derived from the pericarp, and the fibrous material of the leaves.

The leaf-fibre is utilised in the manufacture of the basket-ware of Madras, produced at Pulikat in Chingleput, Kimedi in Ganjam and Bezwada in Godavari, etc. Fine strips of the leaves specially prepared and dyed are plaited into braids and worked up into fancy boxes, cigar-cases and the like.

Some years back investigations were instituted in India with a view to determining the extent to which the cord-like fibres might be employed in brush-making, as substitutes for the American piassaba fibre (*Attalea funifera*) and the Ceylon kittul (*Caryota urens*). So far indications have not been obtained of a very great demand for these special Indian fibres.

The stem or tar fibre is prepared in some special way by the fishermen so that it becomes pliable and can be plaited into fish-traps. It is neither spun nor twisted, a single thread or fibro-vascular bundle being used. The method of preparation adopted by the fishermen has not as yet been made public. The export trade in tal coir, or 'palm-fibre,' as it is often called, centres largely in Tuticorin.

One of the most singular purposes to which the Palmyra leaf is employed in Ceylon is that of being used as a plug to keep open

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and enlarge the holes bored in the lobes of men's ears and in which are ultimately inserted those huge golden rings and masses of jewellery, which the wealthy among the Tamils are so fond of displaying. For this purpose a thin leaflet is neatly cut into a narrow stripe and closely rolled up. In this state its tendency to expand assists materially in keeping the hole open.[1]

The following passage, taken from Rumphius who wrote in 1741, is more of historical interest: "By the inhabitants of Macassar," he says, "these leaves are so much esteemed, that none of the common people dare carry an umbrella or large broad-brimmed hat made of them, except the three highest noblemen in that country, namely, the Princes of Tello, of Goa, and of Sadrabona. They accordingly make umbrellas from the leaf of the Talla (Palmyra), all the radii of which are interwoven with tinsel, and surrounded with a border of ebony, or even covered with Rottanga and silk, so that this broad-brimmed hat or umbrella is always open. If they wish to carry it, they place it on a stick, the handle of which is covered with gold, and which it is not proper for their servants to carry without distinction behind the back; this is permitted only to the nobles." (*Herbarium amboinense.*)

10. Leaves as writing material.—The most singular purposes to which they are devoted is that of writing upon. A well-informed Tamil Native furnished Ferguson with the following information: "The oldest Hindoo author who mentions writing on Olas (Palmyra leaves) is Panniny-rishee who lived about the year 790 of the Caliyugam; that is 4161 years[2] ago, according to Hindoo reckoning. He resided near the source of the River Ganges at a place called Arrittuwarum. He was the inventor of the Sanscrit Alphabet, although verses in Sanscrit were in existence before his time, committed to memory and thus transmitted." We are not able to say what degree of evidence may be attributed to these statements. It is probable that Hœrnle's 'Epigraphical Note on Palmleaf, Paper and Birchbark'[3] contains some more critical

[1] Cf. Ferguson, W. l. c. p. 23-25. Watt. G. l. c. p. 170.
[2] Ferguson wrote this in 1850.
[3] In Journ. As. Soc. Beng. Vol. 69, pt. I, No. 2.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

information on the subject, but, unfortunately, this publication was not at our disposal.

Pliny[1] says expressly that the most ancient way of writing was upon the leaf of the Palm tree, an assertion with all the weight of evidence in its favour.

The following quotations give some interesting details :—Marshall, in his account of the Cocoanut Tree, writes :—

"The leaflets are sometimes used to write upon, and the instrument employed to make the impression is an iron stylus, the pen of the scriptures. The stylus was used by the Romans to write on waxen tablets, leather, etc. The leaves of the Palmyra (*Borassus flabelliformis*), or Talipot (*Corypha umbraculifera*), are, however, much more frequently employed for this purpose. Contracts and other legal instruments are often engraven upon tablets of copper, similar in shape to a slip of the talipot leaf, which have occasionally a border of silver or gold. . . . Palm-leaves, when they are prepared to receive the impression of the stylus, are called ollahs. The natives write letters to one another upon ollahs, which are neatly rolled up, and sometimes sealed with a little gum-lac; in this manner they pass through the post-office. During the operation of writing, the leaf is supported by the left hand, and the letters scratched upon the surface with the stylus. Instead of moving the hand with which they write towards the right, they move the leaf in a contrary direction, by means of the thumb of the left hand. To render the characters more legible, the engraved lines are frequently filled by besmearing the leaf with fresh cow-dung, which is tinged black, by rubbing the lines over with cocoanut oil, or a mixture of oil and charcoal-powder. The natives can write standing, as well as walking, and they rarely use tables.

"Palm leaves, and perhaps the leaves of trees that do not belong to this natural class, were much used by the ancients as writing materials, hence the word leaf (of a book) is synonymous with that of a tree."

The statements respecting the age of Palmyra manuscript books

[1] Lib. XIII, Cap. 2.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and the number of years they are likely to last, are somewhat conflicting. Ferguson does not doubt that Palmyra-leaf manuscripts 400 or 500 years old exist in Ceylon. He says that they are certainly of a more durable quality than paper, and resemble parchment in their texture, when well prepared.

We read in an article written by Brande[1] in 1849 on 'The language and literature of the Island of Bali': "The time at which the manuscript was composed, which I made use of, is the year of Saka 1724 (corresponding to the year of Christ 1802). To judge from the outward appearance I should have taken it to be much older: in 46 years the lontar-leaves (Palmyra) have already become much injured and it seems to prove what is said also of Indian manuscripts, that they can't survive 100 years. This probably is also one of the causes that in Java, in so short a time, almost the whole of the ancient literature was lost, and that when the desire for the old literature was revived, hardly any of the old manuscripts could be discovered. In Bali also we must not look for old manuscripts; however those which are guarded and transcribed in the families of the priests, may almost be considered as original, since in these families the knowledge of language and religion is preserved with the minutest care."[2]

The Palmyra books are never much beyond two feet in length and two inches in breadth, as the size of the webs between the little ribs will not admit of their increase in size.[3]

CULTIVATION IN INDIA.—"This grand palm is not much used in gardens, and perhaps rightly so. It takes up much space, and generally looks unhappy compared with the same species on hill-sides near Bombay, where its tall cylindrical stem crowned with immense fan-shaped leaves is a grand feature in the landscape. But in the Botanical Gardens at Calcutta a special use has been found for which it is well adapted. On the outskirts of the garden a gently winding path, about 12 feet in width, has this palm planted near the sides about 10 feet apart; the effect of the

[1] Journal of the Indian Archipelago and Eastern Asia, Vol. III, No. 4, April 1849.

[2] Cf. also some notes of Lombok in the 'Journal of the Indian Archipelago', etc., Vol. II, No. 3, p. 161.

[3] Ferguson, l. c. p. 26.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

thick stems ornamented by the persistent leaf-stalks is strangely happy. To grow this palm quickly a moist climate is necessary, and the seed should be sown where it is required to grow, because it first sends a shoot downwards to a depth of 3-4 feet, and then from the bottom of this shoot the bud, which forms the stem, is developed." (Woodrow). Some few trees that from unknown causes do not flower in spring, put on their flowers in the cold season, and give a scanty supply of toddy, but in spring many are rendered artificially barren by breaking off the flowering bud as it begins to form. These also flower in the winter season, and are called Basanti. They do not give above 2½ maunds of juice, but this is of as much value as the 6 maunds which a tree gives in spring. Either the male or female will answer for the spring or winter crop, but the female alone will yield juice in the rainy season. When this is wanted, the fruit is allowed to form, and afterwards the point of the spadix or stem which supports the clusters is cut and allowed to bleed. This does not prevent a great many fruit on each cluster from coming to maturity. Palms managed thus are called Ghour. The fruit ripens in August, but many of the stems continue to bleed until October.

CULTIVATION IN EUROPE.—This species is a stove plant. It grows well in good fibrous loam, leaf mould, and sand, mainly in the former. It is propagated by seeds only which must be sown in strong bottom heat.

Fungal disease of the Palmyra Palm.—In 1906 the Imperial Mycologist, E. J. Butler, described a severe epidemic of disease in palmyra and other palms in the Godavari District of the East Coast of India.[1] As a result of field and microscopic examination, the cause of the disease was stated to be a fungus belonging to the genus Pythium. Butler gave a description of it, under the name of *Pythium palmivorum*, in the Memoirs of the Department of Agriculture in India in February 1907.[2] A fuller account of the disease was published by the same author in September 1910,

[1] E. J. Butler. Some diseases of Palms. Agricultural Journal of India, Vol. I. p. 299, Oct. 1906.

[2] E. J. Butler. An account of the Genus Pythium and some Chytridiaceæ. Memoirs of the Dep. Agricult. in India. Vol. I, No. 5 (1907), p. 82.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

under the title: 'The Bud-Rot of Palms in India.'[1] It is from this paper that we borrow the following notes :—

The disease was practically confined to a comparatively limited area in the delta of the Godavari River. A few cases of the same disease were observed at Changarachery (Travancore) in 1907, where the fungus was found producing its characteristic spores in young leaf blades of cocoanut trees in the unexpanded stage of the bud.[2]

The bud-rot is said to have first appeared in Addenkivarilanka, an island in the Gautami Godavari belonging to the Ramachendrapur Taluk, about 1890. From this it spread to both banks of the river and extended along the banks as well as inland. Judging from the extension that has occurred in the area as a whole, the rate of spread is estimated little over a mile a year. It has, however, been ascertained, that in certain places an extension of between 2 and 3 miles occurred. It must not be supposed that the disease is uniformly distributed within its area. Great difference may be observed in the severity of the attack from village to village and even from field to field. It seems that the nature of the soil exercises a direct influence on the susceptibility of the palm to attack. Thus, whilst trees along water-courses and in periodically flooded localities die more quickly and in larger proportion, little disease has been found in the light sandy soils of the sea coast villages. The black soils appear most to favour the disease.

The way in which infection is spread from tree to tree is not yet fully understood. Butler has shown that direct application of the parasitic fungus to the crown of a healthy tree leads to infection of the latter. If this be the case, it is not difficult to account for the spread of the disease by considering the chief possible methods of propagation in similar cases, *viz.*, through the air under certain favourable circumstances, by human agency, especially in cases where the diseased parts of the plant are habitually

[1] E. J. Butler. The Bud-Rot of Palms in India. Mem. of the Dep. Agricult. in India, Vol. III, No. 5 (1910), p. 221-280. 5 pl. and 1 map.

[2] E. J. Butler. Report on Cocoanut Palm diseas n Travancore. Bull. Agric. Res. Inst., Pusa, No. 9, March 1908.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

handled by persons who afterwards come into contact with susceptible portions of healthy trees, *e.g.*, by those who cut the leaves or draw toddy, finally by birds and insects conveying infectious matter on their bodies.

Of the four species of palm common in the Godavari Delta only three were attacked, the Palmyra (*Borassus flabellifer*), the Cocoanut (*Cocos nucifera*), and the Beetlenut (*Areca catechu*), whilst the wild Date Palm (*Phœnix sylvestris*) so far as has been observed, remained immune. By far the greatest mortality was noticed amongst Palmyras; Cocoanuts have suffered much less, and Arecanuts are even less liable to attack than Cocoanuts. That the Cocoanuts suffer much less seems to depend in large measure on a natural resistance presented by this species to the parasite. No experiments have been carried out to investigate the susceptibility of the Areca to attack.

Though palms of all ages are liable to the disease, the majority of cases are mature trees. The intensity of the disease varies enormously in different places.

From experiments conducted by Butler we are allowed to conclude that the fungus is capable of killing moderately sized palms in from 5-10 months from the date of first attack. Speaking of death in this connection we are to understand that period when the central shoot, formed of the innermost, partly expanded leaves, withers and dies. The time which elapses between the death of the central shoot and the loss of all the leaves of the crown is much longer. It appears that 3 years or more may pass before all the leaves have fallen.

With regard to the seasonable prevalence of the disease there are villages in the area mentioned which do not show any marked period of maximum intensity, whilst the deaths are more numerous in the villages of Amalapur Taluk in the months from August to February, than from March to July. "This is in close relation," says Butler, "with the relative humidity of the two periods, and applies equally well to the other affected Taluks. There is a less close relation with the rainfall. In the monsoon, especially in its second half, the mortality appears to reach its maximum, but it is high also in the cold weather months of heavy dew and ground

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fogs, when there is usually little rain. A distinct diminution in the mortality is observable in a good many instances after the cessation of the monsoon, followed by the cold weather recrudescence. This is not general, since a few cases can be quoted where no diminution after the rains occurred."

In its earlier stages the disease is usually confined to the large fleshy leaf-sheaths which encircle the apex of the palm. As the outermost of these are exposed to light and air and, consequently, brown and dry, and moreover partially hidden by the cut bases of older leaves, it is not possible to detect the spots on the outer sheaths in standing trees. In such cases the first indication visible is the withering of the central shoot or of one of the expanded leaves. In certain cases the parasite also occurs on the leaf-blades and even on the petioles, and sometimes the top of the stem is also affected. "The spots on the leaf-sheaths vary much in size, from only just visible to six inches or more across. In the inner sheaths they are white at first, becoming brown or reddish later on. On the outer sheaths they may eventually be black. A very early result of the attack is the collapse of affected cells, which leads to the spots being sunk below the level of the surface of the rest of the sheath. The margin of the depression is usually bounded by a raised rim. The early spots are dry and hard and may either be quite free from any external parasitic growth or covered with a white mycelial web. Later on, particularly in the soft heart of the bud, the diseased areas are invaded by numbers of saprophytic organisms, bacteria, moulds and insect larvæ, and the whole is converted into a foul-smelling rotten mass. On the leaf-blades the spots are usually smaller than on the sheaths, not often exceeding an inch in diameter on individual segments. They are straw-coloured in the centre and bounded by a broad dark-brown margin."

The body of the fungus consists of hyphæ forming a mycelium, which may be entirely buried in the palm tissue or may be partly superficial, where it frequently develops a thick white felt over the disease-spots. The hyphæ measure on an average 5-8μ. They are unseptate except in rare cases, especially near where the organs of reproduction are formed. Within the tissues they occur in the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

intercellular spaces or between adjacent cells and derive their food from the living cells by means of haustoria. The parasite is found in all parts of the leaf, excepting the bundles and bands of sclerenchyma. The reproductive organs arise from the superficial hyphæ. They are of two types, sporangia and resting conidia.

The sporangia are formed terminally on the main branches of the mycelium or on short or long stalks borne laterally on these. They vary much in size and shape. On an average they measure 50 by 35 μ., extremes 38-70 by 33-42. Poor cultures show even smaller ones. The shape is typically pyriform. The narrow end of the ripe sporangium is papillate. There are four types of germination, which must be considered as modifications of the one process: (1) The apex of the papilla swells up into a very thin gelatinous vesicle. The protoplasm of the sporangium passes into the vesicle in a uniform granular mass, forms a number of zoospores by segmentation. The wall of the vesicle ruptures and the ciliated spores escape. (2) Segmentation into zoospores occurs within the sporangium. No vesicle is formed, but the papilla dissolves, or if a vesicle is formed, it ruptures almost immediately. When an opening is formed, the protoplasm escapes and breaks up at once into free zoospores. Intermediate types between this and the foregoing are met with. (3) The zoospores ripen within the sporangium but, on the opening of the papilla, are not able, from one cause or another, to escape. They come to rest after a variable period of movement, round off, become clothed with a wall, begin to germinate and pierce the wall of the sporangium. (4) No zoospores are formed. The sporangium germinates by putting out one or several germ-tubes.

The zoospores measure from 8-10 μ after they come to rest and assume a spherical shape. They germinate rapidly by one or sometimes two germ-tubes.

The second mode of reproduction is by resting conidia. These are spherical, thickwalled, and often yellowish when old. They are formed singly at the ends of usually large hyphæ. Intercalar ones are rare. They measure 25-40 μ in diameter, the wall being up to 4 μ thick. The stalk-hypha shows great variety as regards size,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

shape, and septation. Germination takes place by a germ-tube which, after a short growth, bears terminal sporangia.

Whilst sporangia are usually found on the attacked plants only during the periods of considerable rainfall or heavy dews, the resting conidia are less common in the rainy season, but very common in the hot dry months. No trace of true zoospores has been discovered.

Butler is inclined to believe that the parasite can pass into a dormant condition actually within the bud of the palm and can recommence activity at a later date, progressing until the growing point falls a prey to the attack and death follows.

There are two ways of fighting the disease. The formation of spores may be checked by cutting off the bud from the stem as soon as the first leaf turns white. Infection of healthy trees can be guarded against by brushing or spraying the outside of the bud below the expanded leaves with a fungicide.

The following suggestions were made for an organised campaign against the disease by Butler in 1906.

"A special staff is required, for it is certain that, at first at least the villagers will be slow to take measures for their own protection. If, however, the results bear out the value of the work, real co-operation may be expected before long. A number of expert palm climbers (such as toddy drawers) should be selected under the charge of an agricultural inspector or some similar official and provided with small axes or saws. They should be instructed to climb all diseased trees, both those in the early stages and those already dead, and to cut off the green tops below the swelling of the leaf sheaths. It is particularly essential that all trees in the early stages should be dealt with, and these can be recognized, where the villagers themselves are unable to do so, by the whitening of one of the leaves towards the centre of the head. After cutting off the heads, the whole of the tops should be collected into a heap in each village and burned. In this way every dead or attacked palm in a selected area would have its power of spreading infection destroyed by burning the diseased parts, and this measure alone, if steadily pursued, is certain to give good results. The infectious matter is confined to the head of the palm and, as the tree is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

doomed once the disease appears and will yield no further profit, its removal costs little but the actual expense of labour in cutting it down and burning it. To save healthy trees within the affected districts in places where they are surrounded by large numbers of dead or dying trees, is difficult unless the above measures are very thoroughly carried out. But the chances of their infection may be very largely diminished if they are brushed with Bordeaux mixture on the leaf sheaths when the removal of diseased trees commences. Bordeaux mixture is a substance which adheres strongly to the surfaces of plants and being poisonous to fungus spores, it prevents their germination or kills the young germ filaments as soon as they appear. A second gang of toddy drawers should be employed for this work and provided with small vessels containing the mixture and mops of rags for brushing it on to the sheaths. The expanded leaves need not be brushed, but only the leaf sheaths below these. The men employed for removing diseased trees should not be allowed to climb healthy ones, as there is some danger of their conveying the infection on their persons or axes. "To prepare 50 gallons of the mixture, weigh out 6 lbs. copper sulphate, break to powder and dissolve in 25 gallons of cold water by suspending in a piece of gunny sacking in the water. The latter must not be contained in a metal vessel but in a barrel or big earthenware pot. In another vessel weigh out 4 lbs. of fresh quicklime. Slake this gradually till it falls to powder and then, add water up to 25 gallons. Allow it to cool. When cool, add to the copper sulphate solution through a sieve so as to retain any lumps. A thick bluish liquid results which on standing throws down a bluish precipitate, leaving the other part of the liquid clear. To test if fit for use, add a few drops of Ferrocyanide of Potassium to a small quantity of the clear liquid in a dish. If a brownish precipitate appears, more lime must be added till no precipitate is given on testing. Or a clean steel knife may be dipped in it, and if more lime is necessary, a deposit of copper will form on the knife. If none is found, it is ready for use. Stir well before using."

Since the time these suggestions were made, a large campaign

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

against the disease has been in continuous operation in the Godaveri Delta and since January 1910 it is believed that, in spite of many and great difficulties, every part of the infected area is being systematically dealt with. There is no doubt that there has been no slight diminution in the disease within the area of the operations.

The Palmyra Palm in the Tamil Language.—Ferguson has collected a number of proverbial sayings and illustrations from a volume of Tamil proverbs, published by P. Percival. Many of them are so characteristic of native life in India and interesting in themselves that we consider it worthwhile to reproduce the whole. Fibre used as toothpick—a hit at a spendthrift: "He whose father possesses a thousand Palmyra trees has not a fibre to pick his teeth."—Sharpness of the petiole: "What he saw was a snake but what bit him was the stalk of a Palmyra leaf."—Leaves young and old, illustrative of heirship and succession: "It is said that the young leaves of the Palmyra-tree laughed because the dry leaves fell off."—Tenacity with which fruit clings to the tree: "Will the Palmyra fruit fall because a crow alights on the tree?"—Size and weight of the fruit: "Can Palmyra fruit be suspended from the neck of a little bird?"—Tenderness of the germ-taking unnecessary trouble: "Why use a mallet and wedge for splitting the newly germinated root of the Palmyra, that may be split by the hand." Height of absurdity: "As the scorpion stung the Cocoanut tree, the Palmyra swelled in consequence." Felled timber—removal of obstacles: "As an ass perambulated the place where Palmyra-timber has been felled." Falling from a Palmyra-tree—injuring a fallen man: "A snake bit him who had fallen from a Palmyra-tree."—'Yorkshire, though in London': "The fox of the Palmyra-tree is said to have deceived the fox of the City."—Avoid even the appearance of evil—toddy-drinking discreditable: "If you drink under a Palmyra-tree, it will be regarded as toddy."—Palmyra-tree insufficient for shade: "Is the shadow of the Palmyra-tree a shade, or is the friendship of the malignant friendship."—Rustling of leaves—effects of long experience: "Will the fox of the Palmyra grove be frightened by the rustling of leaves?"—'Tell that to the marines:' "As one

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ascended a Palmyra-tree, and descended without touching the blossom."—The habit of drinking toddy cannot be concealed: "He who drinks milk will belch milk and he who drinks toddy will belch toddy."—Eating a Palmyra-tree—effects of perseverance: "By eating slowly, even a Palmyra-tree may be eaten." How the fruit falls: "The fruit of the tree will fall at its foot."—Young trees—to save your property you must take care of it: "Preserve young Palmyras by cutting, and buffaloes by tying."—Turning the tree to a bad use: "Is it to drink toddy you have reared the Palmyra-tree?"—Witchcraft and basket-making easy arts: "Witchcraft is the easiest of all arts, and the common ola basket is the easiest of all plaits."

THE 'TALA VILASAM'.

There are many descriptions of the Palmyra Palm and its uses written in the various European languages, and nearly all of them mention a Tamil poem, entitled 'Tala Vilasam', which is said to enumerate no fewer than 801 different purposes to which the Palmyra may be applied; and if the writer is possessed of a good imagination, he invariably adds, that the poem in question by no means exhausts the catalogue.

I searched a long time for that poem, of which nothing but the title seemed to be known, and when I found it at last, I was astonished that I had not discovered it sooner. William Ferguson had given a first translation of it about 60 years ago in the appendix of his interesting little volume on the Palmyra Palm of Ceylon.

The poem was written by "Arunachalam, a Poet of Terrukkudantei, the same with Combaconam in the Province of Tanjore."

As the poem is a truly oriental production with the merits and defects of eastern conception, we trust that our readers will not object to our reproducing the poem in extenso, though it may contain a good many repetitions of what has been said above. The fact that it has been translated by a Tamil native accounts sufficiently for the peculiarities of its English style and wording. As we could not procure a copy of the original, we prefer to give it as it stands.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Tala Vilasam.—On the Palmyra tree.

Invocation of Ganesa.

I invoke Ganesa to help in my composition of the work on the Palmyra tree, in the species of poetry called Kali Venpa, and in presenting the same to the people on the sea-girt earth.

O thou lady, resembling Laksimy who is seated on the beautiful lotus! Thou of sweet expressions whose breasts are under stays, and whose person resembles a peacock! hear me tell you in brief an account of one out of the eight hundred items of things connected with the Palmyra-tree, which is emphatically the Kalpa-tree of the earth.

The various productions of earth created by Brahma came short of men's wants; and there was wanting one substance which had an entire power of assuaging hunger, removing disease, feeding the illiterate and enriching the house; and therefore the people of the earth were as unfixed (in all their worldly prospects) as the water on the leaf of a lotus, made poojas and prayed to Sivan for assistance. Sivan heard their prayers and asked of Vishnu with displeasure the reason of his not having daily attended to his duty of preservation? To which Vishnu, in great obeisance, with one arm folded and the fingers of the other put upon his under-lip replied: there is no fault in my course of duty, but the present amount of things created on the earth by Brahma is insufficient. Upon which, Sivan, in great displeasure and anger, looked at Brahma and asked of him the reason of his not having created things to satisfy all the wants of the people of the earth. Brahma trembled and perspired (through fear) and putting his fingers under his under-lip (as a sign of great respect to a superior) and in faltering language, replied: 'My Lord, who is the operative cause and immaculate! What I have already created is all that I knew.' Parvathi (Sivan's consort) then said to Sivan: 'There is fault neither in Vishnu nor in Brahma,' and thus appeased his anger. Sivan, upon this, after meditating in his own mind, said to Brahma: 'Hear me tell you something to supply the wants of the people of the earth. Create the Kalpa-tree upon the earth

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

also.' At the direction of the crescent-moon-adorned Sivan, Brahma created in abundance Palmyra-trees in the three countries of Panathar, Panyoor and Panangasdoor, and called Palmyra-trees by the names of Pootpady, Ponthy, Panay, and Talam. Let me now tell you the various produce and uses of the Palmyra, much extolled by the people of the earth.

If you carefully turn up the ground by hoeing, hedge it, and bury Palmyra-stones in rows at the distance of eight spans one stone from the other, they will return favour, and will never fail, just as the renown of the wise of spiritual blessing will not. When the stones sprout and become tender plants, if you take good care of them not to let the goat, sheep, cow and wild cow feed upon the plants, they will grow in strength, and with the swords of their stems, armed with indented jags on both their sides, they will destroy the iron age of poverty and protect the earth. When the Palmyra tree grows to the height of two bones length, the roots of the stem that fastened the tree will get dry and fall off in season. A female child and a Palmyra tree, if carefully nurtured, will become fruitful in their tenth year. The principle of the blossom (of the Palmyra tree) develops during the months of November and December; the blossom shoots forth as hoarded treasure for the time of exigency in the months of January and February; and then the tender fruits are formed; and of these tender fruits some do fall from the trees out of season. People collect and cut them to pieces, and give them to the cows to eat. Sins may thus be removed, and the cows will give plenty of milk. When the tender fruits of the tree have become larger, they are some of them separated from the trees, the integuments and the adjacent parts are pared off, and the pulpy kernel within is drunk by the people. The drink will remove various diseases, *simulque supprimet vires gonorrheæ.* Had the celestials and the anti-celestials ever tasted of the pulpy kernel, they would never have gone to churn the milky ocean. When the fruits approach towards ripening, they are some of them separated out of the trees, and laid in the sun for a while; the pulp is then pared and boiled in cocoanut milk mixed with the husked seeds of pulse, and is then eaten. When the fruits have become well ripened,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

they fall from the trees, give an agreeable odour; the integument is severed, the fruit is then roasted in fire, washed in pure water and the skin is peeled off. Press the fruits with the hands and swallow the pulp of it; even honey, milk and sugar will not resemble the pulp in sweetness: the fruits may also be sprinkled with reserved Palmyra pulp-water and then be used. Also the pulp is expressed, mixed with rice flour, boiled in oil or ghee, and then used as sweet cakes. The Pandal is made in a suitable place, and a certain spot near the Pandal is nicely daubed with cow-dung. Poojah is offered to Ganesa, his aid is implored, and then the ripe fruits are washed in water, broken by beating with a wooden mallet, and the skin is peeled off; the fruits are then put in Kadaca-baskets, reserved Palmyra pulp-water is poured in, well pressed with the hands; the stones are carefully expressed, and put in another Kadaca-basket and undergo a similar process a second time; the stones are then thrown out in a heap; the fibres of the fruits that lie blended with the expressed pulp are carefully separated by a brush, made of the twigs of certain shrubs; the pulp is then poured upon a mat about twelve cubits long which is spread on a Pandal; well spread over the surface of the mat, and left to dry in the sun during the day time; in the evening the mat is folded, in the following morning it is unfolded. The above mentioned process is continued for about eight days, and when the pulp has become well dried and an inch deep, salt and pieces of Perandi-shrub are sprinkled over, lines are drawn with a weed hook (or sickle), or a like instrument at the distance of a span from one another, the dry pulp is pared off from the mat, and then left to dry for a day more in the sun; the square pieces of dried pulp are then folded, put in a Kooday-basket and laid over a Paran-shelf, to be smoked and to serve for future use.

Hear me, O Lady, the process of dried pulp which a rich man would use. In the pulp expressed from good edible Palmyra-fruits, powder of Palmyra-jaggery and ghee are put, and the pulp is then as before spread over the mat, and when the dried pulp gets half an inch deep, it is as before pared off and reserved for time of want. Another process of preserving dried Palmyra-pulp is the following: the dried Palmyra-pulp is cut into small pieces and steeped in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Palmyra molasses, mixed with roasted powder of pepper, sesamum seeds, rice, and cummin; preserved in an earthen pot, the mouth of the pot is well luted, and then these sweet cakes are used by the country people in their feasts. Hear me again: the pulp that is expressed out of the Palmyra fruits that fall scantily in the latter part of the fruit season, is spread over the mat for two days and left to dry very well; the dried pulp is then peeled off into sheets. An offering of cakes made of the flower of the edible Palmyra roots and of dried Palmyra pulp, together with other fruits, is made in Palmyra plantations to Ganesa. The dried Palmyra-pulp that was preserved is protected without contracting grubs that may spoil it, if the owners are devoted to Ganesa during the time. The dried Palmyra-pulp that it thus preserved may better serve the people as food during the rainy season. Griping of the bowels, diarrhœa and lodging of small fish bones in the œsophagus may be removed by eating dried Palmyra pulp. The stones of the Palmyra fruits that are eaten, and of those that are expressed, are divided into four sorts, put in the ground into beds of 4, 5, 6 or 8 layers, covered with earth, watered twice during the months of August and September and the edible Palmyra roots are dug out in the months of January and February. When there is no rain the skin of the root is peeled off, its head is pared away, the root is cloven into halves, its foot is nipped out, left to dry in the sun, the foot is nipped off in the second and third also, the halves are carefully stirred up to dry well, and then collected and preserved. Such dried edible Palmyra roots are powdered and sifted, salt-water is sprinkled upon the flour, fish, herbs, and other fruits are added to it and mixed together, the paste is then put into a conical Ola-basket and steamed; the poor people eat much of it and get strength.

If the flour of the dried edible Palmyra-root (Odial) be mixed with Cocoanut milk, salt-water and fish, and if the paste be steamed, the cake when eaten will daily add strength to any body. The middle pieces of the Odial are cleared of their outer fibrous skin, soaked in water, then dried and powdered; if the flour be mixed with the cocoanut milk, salt-water, fish and herbs, and if the paste be steamed and then ghee be added

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to it, the cake will indeed be very sweet; if certain fruits and pungent substances be added to the above, the cake will be of an agreeable taste. If the Odial flour be mixed with the scrapings of the kernel of the cocoanut, and powdered rice, cummin, pepper and chilly; if the paste be steamed and the cake be broken and dried, it can be preserved for two months. No other cakes will resemble the above. Sweets are more agreeable to cakes of the above description. If curds, milk, ghee, and cocoanut milk be added to the paste of the Odial flour, and be steamed, the cakes, when used, has the power of *retinendi seminis virilis in corpore sine pollutione, conferendique facultatem horas in thalamo jugali protrahere,* and increasing muscular strength; the person will not be reduced by labour.

I shall now tell you, Lady, of the different kinds of gruel made of the Odial flour; in the boiling water in which fish, chillies, lobsters, acid, grits of rice, have previously been put, in proportion, by little quantities, the Odial flour; stir it, and when it gets boiled and reaches a proper consistency, take the vessel out of the hearth and use it; if certain healthful (*i.e.*, that contributes to the improvement of one's health) fruits be added to the above, anybody may use it. If in water, salt and grits of rice and small fish be put first, and when they get boiled, if Odial flour, mixed with acid and powdered chillies, be poured in and properly stirred, the gruel infused, will be a very healthful one; if herbs and certain fruits be added to the above, the gruel will be a very good one. The people, when they dig the edible Palmyra roots, take some of them and roast in the fire, remove the outer covering and then eat the roots by mastication. If the roasted roots be exposed to the dew and be eaten on the following morning, it will be very nice indeed. The edible Palmyra roots are boiled by steam in water and eaten; also such boiled roots are like the Odial mentioned before, dried in the sun and preserved for future use. The accompaniments that are to be taken with roasted and boiled edible Palmyra roots, are cocoanut, salt,—and pungent substances.

People may eat the sprout that just shoots forth out of the Palmyra stone; the stone, in a certain stage, may be roasted in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the fire, then be broken and the kernel be eaten. There is no comparison to the curry or broth made of very tender edible Palmyra roots and cocoanut milk. The kernel that is formed in the Palmyra stone in its advanced stage will be very sweet.

Hear me now tell you the use of the Palmyra stone shell. It will ever serve as fuel for cooking; if the shell be partially burned and the inner coat of the shell be removed, it will serve as coals to smiths; it will also serve as a powder box, tinder box and a pill-vial.

When the Palmyra tree puts forth blossom, it is rendered fit for yielding the juice by pressing it between two poles, and by beating it with the handle of a knife; its end is properly incised, a vessel is adjusted to it, and toddy is collected; if the toddy be presented in Poojah to Sacti, excellent boons may be obtained. Toddy if drunk, *excitabit amorem et cupidinem in illis, qui in rem uxoriam incumbent.* If taken daily, it will increase one's muscular strength and give a gloss to his person; if used by children in small quantity it will remove itch and many other diseases. If powdered load-stone and scoria of iron and file be put into the pot that is attached to the incised blossom, and the toddy collected in such a pot be drunk for seven days in the morning--asthmatic affections, bloated cheeks and the like may at once be removed—if, in the morning and evening, the pot that should be attached to the blossom be baked in fire, *qui succum in hac olla collectum bibet diutius in copulatione morabitur.* If shell-lime be put in the pot that should be attached to the blossom, and the toddy be used, hunger, thirst, languor and laziness will be removed, heat in the constitution will be destroyed and coolness be created. Toddy will be very sweet if powdered pepper be put in it and boiled. If toddy be boiled nicely, and if slices of ash-coloured pumpkin be boiled in it—the broth, when it is seasoned and used, will create a wonderful power to the stomach to digest any amount of food. If, when the south-wind blows, toddy be collected, strained and poured in a pot, and be boiled until it gets the consistency and colour of Margosa-oil—then be poured either in a new pot or a vessel of Palmyra leaf, the mouth well covered, and the vessel be then exposed to smoke or buried in the earth—the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Palmyra molasses will be candied (*i.e.*, crystallized) : these crystals, if taken into the mouth, will suppress asthma and phlegm.

If the boiled toddy in the above process be still boiled until it sticks a little to the bottom of the vessel and bubbles are formed, you can have Palmyra sugar.

If toddy be so boiled that, if it be taken in a ladle, it will not be drawn into threads, but will break, take it out of the fire, put a little quantity of rice flour and mix it well with the molasses and pour the molasses in pots and little Ola cases; you will have Palmyra jaggery.

If, in the above said stage of consistency, powdered cummin, pepper and sesamum seeds all well roasted be put in the molasses, and if you steadily continue mixing and agitating the molasses, you will have a powder, which may be used to assuage thirst ; such a powder, if it be of the toddy of a male Palmyra tree, may be taken as medical accompaniments ; may also be given to motherless babes. If the proper consistency be not pitched, it will get as hard as sugar-candy.

When toddy ceases to be drawn by the close of March, there will be fruits during the following five months, and during the remaining months there will be dried Palmyra pulp. So, the produce of the Palmyra tree is had in every month of the year. The Palmyra-tree is able to bestow bountifully, and one may eat of its produce in the three seasons of meal every day. The mind will ever love it more than any other thing. If a person only with gratitude to the tree eat of its produce twice or more a day, he will have all the benefits of those that spend the day in fasting and devotion and eat only once a day.

Old Palmyra branches are cut out of the tree every other year, left to dry in the sun a day, made flat by pressing them in a certain manner, and then used for covering and fencing. When the Olas get mouldered, they are used for manuring rice-fields, etc. The inner fibrous bark of the Palmyra stem is used in making cords and ropes, etc., but the outer bark is not so strong as the inner. The Palmyra stem is used in making cots, hedging, and covering an ola book. The white tender Palmyra leaves are used for making baskets of several kinds, as for storing paddy,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

for keeping cloths, betels and arecanuts, sacred ashes and other things, for measuring grain, oil and the like, for making cases of several species, for drawing water, and for making mats of different kinds. The ribs of the Palmyra Olas are used for making cords and ropes, winnowing baskets, and brooms, etc. The tender Palmyra leaves are used for making umbrellas, fans, dolls, vessels to eat from, and rolls for the perforated ears.

The Olas are used in writing the Veds, Shasters, and Agamas, in making deeds, conveyances, dowries, and other presents, in writing interest bonds, in drawing magic diagrams, in writing letters to friends at a distance, in drawing accounts.

The names of Palmyra trees are numberless, such as, the white, the tall, the short, the black-fruited, etc. The roots of Palmyra branches that attach themselves to the tree, and the webs that lie interwoven between them, fall off in season, and may be used as fuel. If the several ingredients of the male Palmyra tree be all collected, rubbed into a paste and mixed with cow-milk, *et si aliquis, qui vult cum fœmina rem habere, hoc bibet, ille tempus copulationis protrahere proterit.* The tender pith of the Palmyra tree that lies in the top part of the tree is eaten by the people.

The timber of the tree is used for building temples, palaces, houses, alms-houses and inns; also as wall-plates, beams, posts, door-frames, pegs, laths and the like. The stump of the tree may be made hollow and used for keeping salt. The produce of the tree may procure to some fields, houses, and jewels. Peace of mind may be secured; one may live in prosperity and great renown. The Palmyra stone, though boiled or roasted in fire, will still sprout; it is, therefore, of a superior quality.

The Pandava kings have regained their lost kingdom, because they have eaten Palmyra fruits when in the wilderness. The Pandya King and others are said as having worn garlands of Palmyra blossoms.

ILLUSTRATIONS.—Plate XXXVIII shows one of the numerous groves of Palmyra Palms in the northern part of Ceylon. In the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

country round Jaffna the Palmyra is at once the most conspicuous and the most beautiful feature of the landscape. The mature forest reaches a height of one hundred or more feet.

The photograph reproduced on plate XXXIX and kindly supplied by Mr. Phipson shows a group of palms from the Victoria Gardens in Bombay. The leaves of the regular spherical crown of the Palmyra Palm seem to arise from a huge cluster of fruits. At the foot of the Palmyra there is a young specimen of the same species, and to the right of it a Fishtail-Palm (*Caryota urens*) has developed three large bunches of flowers and fruits, of which, however, only one is distinctly visible.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A LIST OF INDIAN BUTTERFLIES.

BY

CAPT. W. H. EVANS, R.E.

(*Continued from page 584 of this Volume.*)

Genus.	*Subgenus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
NEMEOBIDÆ —*contd.* :		LIBYTHÆINÆ—*contd.*				
Abisara ..	....	echerius. Stoll.	....	Chamba-As. Centr.	= abnormis, M.	Echerius was described from China, but there are no specimens from this locality in the B. M.; prunosa, the southern form is larger and brighter; the Burmese forms are very puzzling and possibly abnormis ought to be separated, both were described from South Burma.
			prunosa. M..	S. C.		
			angulata. M..	Naga-B.		
			bifasciata. M.	An.		
			kausambi. Fd.	Mergui.		
Stiboges ..	....	nymphidia. But.	....	Bhut-B.		
	PAPILIONIDAE.					
Papilio ..	(Ornithoptera.)	helena ..	cerberus. Fd.	Sik.-B.	.....	The arrangement of the Papilios is that given by Jordan is the Macrolepidoptera. Moore's subgenera are used for the groups defined by Jordan. The long series of each species kept at the Tring Museum form the basis of Jordan's arrangement; the only alterations I have made are under polytes.
			helia conoides. M.	An.		
		aeacus. Fd.	....	Garhwal-B.		
		minos. Gr..	....	S.		
		darsius. Gray.	....	C.		
	(Pangerana.)	aidoneus. Db.	....	Garhwal-Up. B.		
		varuna ..	astorion. Wd.	Kum-B.		
		zaleucus Hew.	....	B.		
	(Menelaides.)	hector. L..	....	Beng-S.C.		
		jophon. Gray.	....	C.		
			pandiyana M.	S.		
		aristolochiæ. Fab.	....	I.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PAPILIONIDÆ—*contd.*						
Papilio —*contd.*	(Menelaides)—*contd.*	....	goniopeitis. Roth.	B.		
			ceylonicus. M.	C		
			camorta. M. .	Ni.		
	(Losaria) ..	coon ..	doubledayi. Wall.	B		
			cacharensis. But.	Cach		
			sambilanga. Doh.	Ni.		
		rhodifer. But.	....	An.	might be put as race of coon.	
	(Byasa) ..	latreilloi. Don.	....	Garhwal-Sik-Up. B.		
			polla. De N...			
		adamsoni. Gr.	....	B.		
		crassipes. Ober.	....	B.		
		nevilli. W. M.	....	Cach.		
		philoxenus. Gray.	....	Kash-Nep.	lama, Ober, is confined to W. China.	
			polyeuctes. Db.	Sik-B.	Bing as a var of philoxenus.	
		dasarada. M.	....	Sik-As.	Bing as a var of philoxenus.	
			ravana. M. ..	Kash-Kum.	Bing as a separate species.	
			barata, Roth,	B		
		plutonius..	pembertoni, M.	Bhut.		
	(Cadugoides.)	agestor. Gray.	....	Sik-B.		
			govindra, M.	Kash-Kum.		
		epycides. Hew.	....	Sik-As.		
			curiatius, Fruh.	Up B.		
			hypochra. Jor.	S. B.		
		stateri. Hew.	....	Sik-Up B.		
			marginata. Ober.	Shan St.		
			tavoyanus. But.	Ten.		
	(Chilasa) ..	paradoxus.	telearchus. Hew.	As.-B.		
			(d. danisepa. But).			
		clytia. L ..	....	Simla-B. S. C.	.....	Jordan considers the forms of clytia to probably represent local races in the making.
			(v. casyapa. M.)	I.		
			(v. lankeswara. M.)	S. C. Ten.		
			(v. commixtus. Roth.)	Sik-As.		
			(v. onpape. M.)	B.		
			(v. papone. Wd.)	S. B.		
			(v. janus. Fruh.)	S. B		
			(d. dissimilis. L.)	I. B. C.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PAPILIONIDÆ—*contd.*						
Papilio —*contd.*	(Chilasa) *contd.*	....	flavolimbatus. Ober.	An.		
	(Tamera) ..	castor. Wd.	....	As		
			polias Jor. ..	Sik-Up. B.		
			mehala. Gr. S.	S. B.		
		mahadeva. M.	....	S. B.		
		dravidarum. W.M.	....	S		
	(Papilio) ..	machaon ..	asiatica. Mén.	Bil. Chit-Nep.	Sphyrus Hüb, an European variety.	
			(v. ladakensis M.)			
			sikkimensis. M.	Sik-Bhut.		
			verityi. Fruh.	Up. B.		
		xuthus. L .	....	Up. B.		
		demoleus. L.	....	I. Up. B.		
			malayanus. Wall.	S. B.		
	(Charus) ..	demolion. Cr.	....	Ten.		
			liomedon. M.	S.		
		noblei. DeN	....	B.		
		chaon. Wd.	....	Nep-B.		
			ducenarius. Fruh	Ten.		
		helenus L.	....	Muss.-B.	.....	Jordan gives sakontala and walkeri as separate species in the helenus (charus) group: of walkeri only one specimen is known and of sakontala very few, but there are also several aberrations of polytes known, that are neither sakontala or walkeri: under the circumstances would it not be better to sink all these specimens as aberrations of polytes. No doubt the male organs of walkeri and sakontala are very different to those of polytes, but is not this rather to be expected with aberrations.
			daksha M. ..	S.		
			mooreanus. Roth.	C.		
		iswara White.	....	Mergui.		
		fuscus ..	prexaspes Fd.	B,		
			andamanicus Roth.	An.		
		hipponous.,	pitmani. El & DeN.	S. Ten.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PAPILIONIDÆ—*contd.*						
Papilio—*contd.*	(Laertias)...	polytes ..	romulus Cr.	I. B. C.	=sakontala Hew, walkeri Jan, casual aberrations polytes. L. China.	Jordan confines polytes to China, giving the Indian race as romulus, the name under which the hector like females were described, while polytes was used for the aristolochiae like females. I propose here to employ stichius for the latter form of female though up to the present it has only been used for the females of this form that have no spot in the cell of the hindwing. The female resembling the male stands as cyrus. I propose the name *stichioides* for the aristolochiae like females from the Andamans and Nicobars, where the romulus form does not occur.
			(Female d. cyrus. Fab). (Female d. stichius Hüb) nikobarus. Fd. (Female d. stichioides. Ev).	An. Ni.		
	(Iliades) ..	polymnestor Cr.	.....	Sik-S.		
			parinda M.	C.		
		mayo. Hew.	.....	An.		
		memnon ..	agenor. L.	Sik-B.		
		protenor Cr	.....	Kash-Kum.		
			euprotenor. Fruh-	Sik-B.		
		rhetenor Wd.	....	Kum-B.		
			(Male v. leucocelis. Jor.)	....	Form with a dorsal white patch on the forewing above.	
	(Mimbyasa)	janaka. M.	....	Muss-Sik.	.....	Moore places janaka and bootes in Byasa with latreillei, etc: I propose *Mimbyasa* as the subgenus for these two species.
		bootes. Wd.	....	As.		
	(Achillides)	elephenor. Wd.	....	Up. As. Naga.		
		dialis ..	schanus. Jor.	S. Shan St.	=doddsi. Janet, Tonkin, described from Tonkin.	
		bianor ..	gladiator. Fruh.	S.B.	.....	Seitz records P. demetrius Cr. (=carpenteri but) from N. India, but this seems to be an error.
		polyctor Bdl.	....	Chit-Nep.		
			ganesa. Db.	Sik.		
			triumphator. Fruh.	As.		
			significans. Fruh.	S. B.		
		paris. L. ..	....	Kum-B.		
			tamilana. M.	S.		
		arcturus. Wd.	....	Nep-B.		
			arius Roth ..	Kash-Kum.		
		krishna M.	....	Sik-Up. B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PAPILIONIDÆ —*contd.*						
Papilio —*contd.*	(Achillides) —*contd.*	crino. Fab.	....	Beng. S.	montanus, Fd. an. ab.	
			fruhstorferi, Rob.	C.		
		buddha, Wd.	....	S.		
		palinurus. Fab.	....	B.		
	(Pathysa) ..	eurous ..	cashmirensis, Roth.	Kash-Kum.		
			Sikhimica. Heron.	E. Kum-As.		
		glycerion, Gray.	....	Sik-up B.		
		agetes. Wd.	....	Sik-B.		
		nomius, Esp.	....	Sik-S. C.		
			swinhoei. M.	Up As-B.		
		aristeus ..	anticrates, Db.	Sik-As.		
			hermocrates. Fd.	B.		
		antiphates.	pompilius, Fab.	Sik-B. S.	antiphates, Cr., China.alcibiades, Fab., Java.	
			naira. M. ..	Trav.		
			ceylonicus, Eimer.	C.		
			epaminondas, Ober.	An.		
	(Meandrusa)	gyas. Wd ..	....	Sik-As. SB.		
			aribbas, Fruh.	Up. B.		
		payeni ..	evan, Db.	Sik-As.		
			amphis, Jor.	B.		
	(Zetides) ..	cloanthus, Wd.	....	Kash-B.		
		sarpedon L.	....	Him-B.		
			teredon, Fd.	S. C.		
		doson. Fd.	....	C.	Jordan, sic; he rejects jason, L.	Jordan separates eurypylus and doson on the male organs; superficially eurypylus differs in that on the underside of the hindwing the dark sub-costal band is usually posteriorly united to the dark sub-basal band and does not end inside the silver band; if the two dark bands are not united the basal margin of the silver band is notched at the sub-costal vein. There are several specimens of cheronus in the B. M. over the label "acheron, Fruh."
			eleius, Fruh.	S.		
			axion, Fd.	Kum-B.		
		eurypylus..	cheronus, Fruh.	Sik-B.		
			macronius, Jor.	An.		
		bathycles ..	chiron, Wall.	Sik-B.		
		agammemnon, L.	....	Kum-B.		
			menides, Fruh.	S, C.		
			andamana. Lathy.	An.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PAPILIONIDÆ —*contd.*						
Papilio —*contd.*	(Zetides) —*contd.*	....	decoratus, Roth.	Ni.		
	(Paranticopsis).	macareus..	indicus, Roth.	Sik, Bhut.		
			lioneli, Fruh.	As.		
			gyndes, Jor.	B.		
		xenocles, Db.	....	As.		
			phrontis, De N.	E, Kum.-Bhut.		
			kephisos, Fruh.	B.		
		megarus, Wd.	....	Sik.-B.		
			similis, Lathy.	Shan. St.		
Leptocircus.	....	curius, Fab.	....	Naga H.-B.		
		meges ..	virescens, But.	B.	meges, Zink., Java.	
			indistincta, Tytler.	Naga H.		
Teinopalpus.	....	imperialis, Hope.	....	As.-Up. B.		
			himalaicus, Roth.	Nep.-Bhut.		
			imperatrix, De N.	Taungoo.		
Armandia.	....	lidderdali, Atk.	....	Bhut.-Up. B		
Parnassius.	(Parnassius).	jacquemontii, Bdl.	....	Kash.-Kum	=himalayensis, El.	Stichel gives Parnassius stubbendorfi tartarus from Kashmir but the locality seems very doubtful.
			impunctata, Aast.	Sik.		Fruh. gives the Sikkim form of jacquemontii as himalayensis, but this name was used by Elwes for what is now called jacquemontii: the only form described from Sikkim is impunctata; there are no Sikkim specimens in the B.M.
			chitralensis, M.	Chit.		
		cephus, Ober.	....	Kash.-Kulu.		
			sikkimensis, El.	Sik		
		hardwickii, Gray.	....	Chit.-Kum.		
			viridicans, Fruh.	Sik.		
	(Koramius).	delphius ..	chitralica, Verity.	Chit.	hunza, Cr., Hindu Khush.	
			stenosemus, Hon	Kash.		
			stoliczanus, Fd.	Lad.-Kulu.	atkinsoni, M. a female ab or var.	
			lampidius, Fruh.	Sik.	=whitei, Bing.	
	(Tadumia).	acco, Gray.	....	Lad		
			gemmifer, Fruh.	Sik.		
		simo, Gray.	....	Lad.		
			acconus, Fruh.	Sik.	=mœlleri, Bing.	
	(Kailasius).	charltonius Gray.	....	Chit-Sik.		
		imperator.	augustus, Fruh.	Sik.		
Hypermnestra.	....	helios ..	maxima, Lang.	Bal.	=balucha M. helios, Nick., Persia.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PIERIDÆ.						The arrangement of the Pieridæ differs little from that given by Bingham. Ixias is placed after Appias.
Leptosia ..	....	xiphia, Fab.	....	I. B.		
			nicobarica ..	Ni.		
Delias ..	(Piccarda) .	agostina, Hew.	....	Sik.-B.	Fruh. sep infuma, As-B.	
		singhapura	agoranis, Gr. S,	S. Ten.		
		hyparete ..	hierte, Hüb...	E. Kum-B.		
			ciris, Fruh...	S. Ten.	metarete But., Malay Penin.	
			ethire. Doh..	Beng-N Madras.		
		eucharis, Drury.	....	I. B. C.		
		descombesi	leucacantha, Fruh.	Sik.-B.	descombesi, Bdl, Cochin China. Fruh. sep female vars auriga and leucogæa.	
	(Delias) ..	belladonna, Fab.	....	Kulu-Kum.	.....	The forms of belladonna are puzzling: typical belladonna occurs throughout its range, but from Sikkim Eastwards it is rare; ithiela being the common form: sanaca flies with belladonna in the W Himalayas and so cannot be regarded as a seasonal form, it grades to belladonna and so cannot be regarded as a separate species though considered o by some authors.
			(v.sanaca, M.)			
			ithiela, But.	Sik.-B.	Fruh. sep berinda M., As and persplicua Fruh., Up. B.	
		aglaia, L...	....	Sik.-B.		
			beata, Fruh.	Ten.		
		thysbe ..	pyramus, Wall.	Sik.-B.		
			kandha, Doh.	N. Madras.	thysbe, Cr., China.	
Prioneris..	....	thestylis, Db.	....	Muss-B.		
			jugurtha, Fruh.	Ten.		
		sita, Fd. ..	....	S. C.		
		clemanthe, Db.	....	Sik.-B.		
Anaphaeis..	....	mesentina, Cr.	....	I. Ni.		
			taprobana, M.	C.		
Baltia ..	....	shawii, Bates.	....	Chit-Lad.	.....	I have seen a Baltia caught in Sikkim: it is very close to butleri. The Indian form of shawii is larger and lighter than Central Asian specimens but the B. M. material is very scanty.
		butleri, M.	....	Lad.		
			sikkima, Fruh.	Sik.		
Aporia ..	(Aporia) ..	soracta, M.	....	Kash.-Kum.	?=denigrata. Fruh. Punj., N.W.F.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PIERIDÆ—*contd.*						
Aporia —*contd.*	(Aporia) —*contd.*	leucodice..	balucha, M...	Bal-Chit.	.....	A. leechii is a good race of balucha and has nothing to do with soracta. In the B. M. as female balucha are placed several yellow butterflies caught by me in Chitral in quite different localities to those frequented by balucha: they are in fact a form of nabellica and I propose to call them *hesba*: they vary from nearly white to lemon yellow, more or less dusted with black scales but never so profusely as nabellica often is: the hindwing is rarely dusted with black scales.
			leechii, M. ..	Hunza-Lad.		
		nabellica, Bdl.	....	Kash-Kum.		
			hesba, Ev. ..	Chit.		
		larraldei ..	harrietæ, DeN.	Bhut.		
	(Metaporia)	agathon, Gray.	....	Nep-As.		
			phryxe Bdl..	Kash-Kum.		
			(v. caphusa, M.)			
			(v. ariaca M.)			
Pieris	.. (Pieris)	.. brassicæ, L.	....	Chit-As.		
		deota, DeN.	....	Kash-Lad.		
		canidia, Sparr.	....	Chit-up B.	.....	In the B. M. the series of canidia from S. India presents a different appearance to the numerous specimens from N. India, though it is not easy to put the difference in words: the Southern form is larger with the black markings more developed especially those on the margin of the hindwing. I propose to call this race *canis*.
			canis, Ev. ..	S.		
		nagan u m, M.	....	As-up B.		
		rapae, L...	....	Chit Lad.		
		melete ..	ajaka, M. ..	Kash.-Up B.	=montana, Verity (E form) melete Men,-China.	Pieris is here extended to embrace certain closely allied genera. melete from China is a large and very distinct form: Indian specimens present a lot of variation, dry season Kashmir specimens being very like napi: melaina from the Chumbi valley is very distinct, but the Eastern form separated by Verity as montana resembles the form from Mussoorie, etc., very closely.
			melaina, Röb.	Sik-(Chumbi).		
		krueperi ..	devta, DeN...	Bal-Chit Lad.		
	(Parapieris	callidice, Esp.	....	Chit-Garhwal.	Röb, Indian race as kalora M.	
		chumbiensis, Den.	....	Sik-(Chumbi).		
	(Pontia) ..	daplidice, L.	....	Bal-Chit-Lad.	Röb, Indian race as moorei.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes*
PIERIDÆ—*contd.*						
Pieris—*contd.*	(Pontia)—*contd.*	glaucono-me, Klug.	....	Bal-Chit. Panj.		
	(Synchloe).	chloridice, Hüb.	....	Chit-Lad.	Recorded from Kumaon but probably an error.	
		belia ..	daphalis, M..	Chit-Kunawur. Panj.		
	(Anthocaris).	lucilla, But.	....	Panjab.		
Huphina ..	....	nerissa ..	phryne, Fab..	Nep-As.	nerissa Fab. China.	
			evagete, Cr..	I. C.		
			dapha, M. ..	As.-B.		
			lichenosa, M.	An.		
		nadina, Lucas.	....	Sik.-B.,		
			remba. M. ..	S.		
			cingala, M. ..	C.		
			andamana, Sw.	An.		
		lea, Db. ..	....	S. B.		
Appias ..	(Tachyris)..	nero. ..	galba, Wall ..	Sik-B.	nero Fab. Java.	
			figulina, But.	Ten.		
	(Appias) ..	lyncida ..	hippoides, M..	Kum-B.	-Orissa.	
			latifasciata, M.	S.		
			taprobana, M.	C.		
			nicobarica, M.	Ni.		
		libythea, Fab.	....	Panj.-Sik.-S. C.		
			zelmira, Cr.	As.-B. Beng.		
	(Catophaga)	albina ..	confusa. Fruh.	Sik.-B. Beng.	albina, Bdl., Moluccas.	The arrangement of the Catophaga and Hyposcritia sections of Appias is exactly as given by Fruhstorfer: no doubt the series on which it is based is better than the poor one in the B. M. He states that the melania group differs from the albina group in that the melania males have a broader grey apical patch, formed of big diffused spots. I have placed wardi as a race of melania.
			(female v. semiflava. Fruh).			
			swinhoei. M.	Centr.-S.		
			venusta. M.	C.	neomba, Bdl., Sumatra.	
			(female flava. Röb.)			
		melania ..	darada. Fd.	Sik.-As.		
			adamsoni. M.	B.		
			wardi, M.	S.		
			yaksha, Fruh.	Poona Dist.		
			paulina Cr.	C.	=lankapura M., galene, Fd. fasciata, Fruh., an ab.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PIERIDÆ.—*contd.*						
Appias. —*contd.*	(Catophaga) —*contd.*	melania— *contd.*	galathea, Fd.	An.-Ni.		
	(Lade)	.. lalassis Gr. S.	....	S. B.		
	(Hyposcritia.)	indra, M...	....	Nep.-B.		
			shiva. Sw.	Beng. Poona Dist.		
			statilia, Fruh.	S.		
			narendra. M.	C.		
		lalage, Db.	....	As.-Naga Hill.	.....	These races of lalage are not very satisfactory: typical durvasa and lalage differ, but both forms meet in Sikkim.
			durvasa. M.	Kulu-Sik.	=pseudolalage, M. confluens Fruh., an ab.	
			argyridina. But.	B.		
			lagela. M.	S. B.		
Saletara ..	....	panda ..	chrysea. Fruh.	Ni.		
Ixias ..	....	pyrene ..	rhexia, Fab.,	Kulu-Up-B.	pyrene L., and evippe, Dr., China.	The forms of Ixias are very puzzling and I hope the arrangement given will prove satisfactory: rhexia is the large hill form with a white female and grades with pirenasse the plains form: in South India the prevailing form of male is very like cingalensis, but Ceylon females have the base of interspace 3 yellow. South Indian females are very variable. Latifasciata, the South Burma race, has a very pale dry season form (=pallida, citrina, M) which Bingham treated as a separate species.
			pirenassa, Wall.	I.B. (plains)		
			cingalensis, M.	C.	Fruh. gives females vars conectens and nivescens.	
			latifasciata, But.	S. B.		
			andamana, M.	An.		
		mariannee Cr.	....	Kum-S. C.		
			nola, Sw. ..	Mahableshwar.		
Dercas ..	....	verhueli ..	doubledayi, M.	Sik-Bhut.	verhueli, Hoev, China.	
			pallidus, Fruh	As.-B.		
		lycorias, Db.	....	Sik.-As.		
			(v. decipiens, DeN.)	....	=brindaba, Sw. ..	
Gonepteryx	....	rhamni ..	nepalensis, Db.	Chit-Up-B.		
		zaneka, M.	..	Kash-Kum.		
			zanekoides, DeN.	Up-B.		
			chitralensis, M.	Chit.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PIERIDÆ–*contd.*						
Catopsilia.	....	pyranthe, L.	....	I. B. C.		
		florella, Fab.	....	I. B. C.		
		crocale, Cr.	....	I. B. C.	.....	Fruh. gives many forms of male and female varieties of crocale and pomona but they hardly seem worth retaining: Mr. Bell has proved that these two species have distinct larvæ.
		pomona, Fab.	....	I. B. C.		
		scylla, L...	....	S. Ten.		
Colias ..	....	hyale ..	lativitta, M..	Bal-Chit-Kum.	hyale L., erate Esp. Europe.	Röber treats erate and hyale as separate species: Fruhstorfer unites them: lativitta is the erate form which grades with glicia, the hyale form with the spotted border: pallidus is the white form of female.
			(male v. glicia, Fruh.) (female d. pallida, Röb.)			
			(h. chrysodona, Bdl.)	Bal-Chit.		
			nilagiriensis, Fd.	S.		
		ladakensis, Fd.	....	Kash-Muss.	.....	I believe that thrasibulus and ladakensis will eventually prove to be races of the same pecies. Fruh. described phicomone phila from a single male from Kashmir; he has since found that the locality was erroneous.
			berylla, Faw.	Sik.		
		cocandica.	thrasibulus, Fruh.	Lad.		
		alpherakii.	chitralensis, Verity.	Chit.		
		wiskotti, Std.	....	Chit.		
		dubia, El..	....	Sik.	=? miranda, Fruh.	
		stoliczana, M.	....	Kash-Lad.	? race of eogene ..	
			miranda, Fruh.	Sik.		
		eogene, Fd.	....	Chit-Kum.	.....	The eogene group is very puzzling: in the B. M. there are series of eogene from Chitral and Baltistan, agreeing "fairly" well: from the same districts in Ladak there are numerous specimens arranged as leechii Gr. and stoliczana but the forms seem to grade: miranda first recorded by Fawcett as leechii (hence Swinhoe giving Sik. as a locality for the latter) is a very unsatisfactory form, *vide* Elwes' remarks when describing the form dubia, which probably = miranda. I believe that all are forms of eogene.
			(female d. cana, Röb.			
			leechii, Gr...	Lad.	? var of stoliczana.	
		fieldii, Mén.	....	As.-Up-B.	.....	The eastern form of fieldii is just like the Chinese form, *i.e.*, true fieldii.
			edusina, But.	Chit-Sik.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PIERIDÆ—*contd.*						
Terias	.. (Kibreeta)	· libythea, Fab.	....	I. B. C.	Fruh. sep fruhstorferi M., As.-B.	
	(Nirmula)	. venata, M.	....	I. B. C.	Fruh. sep rama M., S. C. and sikkimica M., Sik B.	
		laeta, Bdl..	....	I. B.	Fruh. sep pseudolacta M., Ten.	
	(Terias)	.. hecabe, L..	....	I. B. C.-An. Ni.	.....	Fruh. separates hecabe and silhetana (given as a race of blanda) into a number of races in Lepidoptera Indica 26 "species" are given, I do not see that any good purpose is served by retaining any varieties or races except moorei, whose d. s. f. is as typical silhetana.
		silhetana, Wall.	....	Sik.-B. S. An.	Fruh. as race of blanda M., Java = ? hecabe.	
			moorei, But..	Ni.		
		andersoni, M.	....	Muss-B.?C.		Andersoni certainly occurs in Sikkin, though Bing. doubted it. Sari is recorded from S. India and Ceylon: the only specimens in the B. M. marked as such are two from Ceylon which may be andersoni, but are certainly not sari.
		sari, Hors.	....	Ten.	Fruh. Indian race as sodalis, M.	
	(Gandaca)	. harina	.. assamica, M. burmana, M. andamana, M.	Beng. Sikup B. S. B. Ten. An.		
Colotis	.. (Colotis)	.. calais, Cr..	....	Panj. Sind, Cutch.	=dynamene, Klug.	amatus constantly differs from calais in that the black spot on the margin near the dorsum is not detached and quadrate. The dimorphic white female of amatus does not seem to have been named: I propose to call it *albina*. I have omitted phisadia, God., as the only record of it is one specimen from Mooltan, which very likely was a hybrid between vestalis and protractus: similar hybrids have been recorded from Karachi. :
			amatus, Fab. (female d. albina, Ev.)	I. C.	=modesta, But., cypræa, Fab.	
		protractus, But.	....	Bal.-Panj. Cutch.		
		vestalis, But.	....	Bal. Panj.-Central I.	=puellaris, intermissus, But.	
	(Madais)	.. fausta, Oliv.	....	Bal. Panj.-Bombay.		
		...	fulvia, Wall..	S. C. Beng.	=tripuncta, But.	
	(Callosune)	etrida, Bdl.	....	I.		
			limbata, But.	C.		
		eucharis, Fab.	....	Centre I.-S. C.		
		danae, Fab.	....	Bal-S. C.	=subroseus, S.W., dulcis, But.	The form of danae from Sind is almost worth separating.
Hebomoia	..	glaucippe, L.	....	Central I. Nep.-B.		
			australis, But.	S. C.	=ceylonica Fruh., C form.	glaucippe and australis seem to both occur in S. India.
			roepstorfii, W.M.	An.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
PIERIDÆ—*contd.*						
Pareronia.	....	avatar, M..	....	Sik.-B.		
			paravatar, DeN.	Ten.		
		valeria ..	hippia, Fab..	I. B.	.....	Typical ceylanica (a w. s. f.) is confined to Ceylon; its. d. s. f. fraterna (=spiculifera) occurs in S. India and Ceylon, while in certain parts of S. India it seems to grade with hippia. Pingasa seems to be a w. s. f. confined to S. India. I believe that pingasa and ceylanica are races of the same species and possibly hippia may eventually turn out to be conspecific. More dated specimens from all districts are wanted, Naraka presents certain constant, though small, differences.
			(female v. livilla, Fruh.)			
		pingasa, M.	....	S.		
			naraka, M. ..	An.		
		ceylanica, Fd.	....	S. C.	=fraterna, spiculifera. M.	
LYCÆNIDÆ.		GERYDINÆ.				
Gerydus ..	....	symethus. Cr.	....	Ten.		
		boisduvalii, M.	....	Sik-B.	=irroratus, Druce, Siam.	
			longeana. DeN.	Up B. (dry zone).		
		assamensis. Doh.	....	As.		
		ancon, Doh.	....	Ten.		
		croton, Doh.	....	B.		
		biggsii, Dist.	....	B.	=gopara, DeN.	
Allotinus..	....	drumila M.	....	Sik.-As.		
		subviolaceus, Fd.	....	S. B.		
		horsfieldii, M.	....	As.-B.		
		taras. Doh.	....	S. B.		
		panormis, El.	....	Karen. H.		
		nivalis, Druce.	....	Ten.		
		multistrigatus, DeM.	....	Sik.-B.		
Logania ..	....	marmorata, M.	....	S. B.		
			watsoniana. DeN.	Up. B.		
			massalia. Doh.	Up.As.		
LYCÆNIDÆ.		LYCÆNINÆ.				
Pithecops.		hylax. Fab.	....	Sik.-B.	.....	In the arrangement of the Lycæninæ Bingham has more or less been followed: Swinhoe's arrangement is very different.
		fulgens. Doh.	....	As.		
Neopithecops.		zalmora. But.	....	I. B. C.		
Spalgis ..		epius, Wd.	....	I. B. C.		
			nubilus, M.	An.-N. I.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ.—*contd.*		LYCÆNINÆ—*contd.*				
Taraka ..	....	hamada, Druce.	....	Sik.-B.		
Megisba ..	....	malaya, Hors.	....	....		
Una ..	....	usta, Dist.	....	Naga H.		
Cyaniris ..	(Notarthrinus).	vardhana. M.	....	Kash-Kum.	.....	Dr. Chapman in P. Z. S., 1909, I. p. 419 gave a revision of the genus "Lycænopsis" (*vice* Cyaniris rejected) based on the male organs; lilacea was unfortunately omitted: with a few alterations Dr. Chapman's arrangement is here followed.
		musina ..	musinoides, Sw.	Khasi-Ten.	musina, Snell, Java.	The Javan musina is distinct enough, but without examining the male organs I do not see how musinoides is to be distinguished from jynteana. Binghami can be recognised by the even wide dull brown border, below it is very like jynteana.
		binghami, Chp.	....	B.		
	(Cyaniris).	melaena, Doh.	....	S. Ten.		
		marginata, DeN.	....	Kum.-B		
		akasa. Hors.	....	S.C.		
		albocæruleu, M.	....	Simla-Up B.		
		transpecta, M.	....	Sik.-B. Ni		
		lilacea, Hamp.	....	S.		
		puspa, Hors.	....	I. B. C. An.	.....	Dr. Chapman states that placida and jynteana are races of limbata; I have seen the specimens he examined and each of the so called jynteana I would have identified as placida: Moore's type of jynteana from the Khasi Hills (I have not seen DeN's type) and of sikkima from Sikkim are forms of argiolus and I am sure that an examination of their male organs would confirm this.
			cyanescens. DeN.	Ni.		
		albidisca, M.	....	S.		
		dilecta, M.	....	Simla-Up. B.		
		lanka, M.	....	C.		
		limbata, M.	....	As. Beng. S. C.		
			placida. DeN.	Sik.-B.		
		argiolus ..	cœlestina, Koll.	Chit-Kum.	=puspargiolus, bothrinoides, albocœruleoides Chap. ? parrishii, Rhé Philippe. sikkima. M.	Jynteana is a very variable form: I do not think that Dr. Chapman's varieties are worth retaining: Victoria is, I think, a d s. f. form "greyed over": I have seen similarly "greyed over" specimens of puspa, dilecta and placida.
			jynteana, DeN.	Sik.-Up. B.		Parrishii probably=Jynteana (or ? musinoides or binghami): in a difficult group like this to describe a new species from a single specimen without even examining the genitalia is inadvisable.
			(v. victoria, Sw).	....		I have specimens of imbata from Assam.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.,*	*Notes.*
LYCÆNIDÆ—*contd.*		LYCÆNINÆ.—*contd.*				
Cyaniris —*contd.*	(Cyaniris)	huegeli, M.	....	Kash-Kum.	.....	Dr. Chapman states that huegeli is conspecific with cœlestina: I have left them separate for the present: it is not a case of seasonal variation but may be dimorphism. Breeding experiments are necessary. Huegeli does not occur in Chitral though cœlestina is common. I place oreana and singalensis here: in size, etc., they are very like huegeli.
		oreas	oreana, Swin.	Khasi.	oreas=Leech, China.	
		singalensis. Fd	....	C.		
	(Bothrinia)	chennellii, DeN.	....	As.-Up. B.		
Lycæna	(Plebeius)	christophi	samudra, M,	Chit.-Kash.	=bracteata=But.	L. bracteata is given by Seitz separately as a race of argyrognomon, Berg., the type specimen is an exact synonym of samudra. The Chitral form of samudra differs in having the discal spots on the forewing below very enlarged.
		loewii, Zell.	....	Chit.		
			chamanica, M.	Bal.		
		cytis, Lang.	....	Chit.	.....	The Chitral form of cytis is typical; the form of iris is rather darker than the typical form from Alai.
		iris, Std.	....	Chit.		
	(Scutilantides).	baton	cashmirensis, M.	Bal.-Chit.-Kash.	=vicrama, M. hylas Esp is a different species.	
	(Latiorina).	orbitulus	jaloka, M.	Kash.		
			leela, DeN.	Lad.	=ellisi, DeN.	The Chitral form of orbitulus is very different to jaloka and leela, being more like the European form: the male above is a brilliant shining light blue green, the outer margin being rather broad, there are no white spots above, the spot at the end of the cell is black; the female is brown with a white encircled black spot at the end of the cell and some obscure white postdiscal spots: it is larger than jaloka. I propose to call it *walli* after Maj. F. Wall, I. M. S., who obtained a good series at 12,000 feet in July 1910.
			walli, Ev.	Chit.		
	(Albulina)	pheretes	lehana, M.	Chit.-Sik.	.....	L. pheretes lehana and asiatica occur together in Sikkim.
		asiatica, El.	....	Sik.		
	(Lycæna)	metallica, Fd.	....	Chit.-Lad.	.....	As pointed out by Swinhoe, metallica and omphissa are separate: Chitral specimens of metallica are not so green as the typical form.
		omphissa. M.	....	Lad.		I have used Swinhoe's subgenera with addition of *Tiora* and *Bryna* (*vice* Polyommatus): Tiora is for the simple eyed section with metallic spots on the hindwing below: a new subgenus is perhaps required for sebrus.
		galathea, Blanch.	....	Chit.-Kum.		
		youngh u sbandi. El.	....	Sik.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

3 n

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes
LYCÆNIDÆ—*contd.*		LYCÆNINÆ—*contd.*				
Lycæna —*contd.*	(Aricia)	astrarche, Berg.	....	Bal.-Chit.-Kum.	=medon, L.	
		eumedon. Esp.	....	Chit, Gilgit	=antiqua Std., jermyni, Sw.	In Chitral typical eumedon and antiqua fly together and intergrade.
	(Bryna)	stoliczana, Fd.	....	Chit.-Sik.	=ariana M. drasula, Sw.:sutleja, and pseuderos, M.	I believe only one stoliczana like species flies in India, of which balucha is a race; Seitz gives eros sutleja and balucha; stoliczana and icarus are very variable but cannot, I think, be further separated into well defined races or varieties.
			balucha, M.	Bal.	usually as a race of eros Ochs.	
		icarus, Rott.	....	Bal.-Chit.-Lad.	=persica, Bien.: fugitiva, But.: chitralensis, Sw.: drunela, Sw.	
	(Tiora)	sebrus	shandura, Ev.	Chit.	sebrus, Bdl., Central Asia and Europe.	L. *shandura* is, I think, a race of sebrus, Bdl.: it differs however in having obscure metallic spots near the anal angle of the hindwing below: shandura is smaller than sebrus, dull dark blue above, below the spots are very small and regular and arranged just as in sebrus,
		devanica, M.	....	Chi.-Lad.		L. devanica is a large species with the blue colouration on the forewing very reduced and a black female: it flies at 8000 feet in Chitral with sartoides. On the Shandur Pass (12000 feet) there flies a third form very similar to devanica differing in being much smaller (size of iris) and in having the blue colour above extended to the margin. I propose to call it *gracilis*: the cilia are chequered as in devanica.
	(Phengaris)	sarta	gracilis, Ev.	Chit.	sarta Alph, Turkestan.	
		atroguttata Don.	sartoides, Sw.	Chit.	.....	
Chilades	....	laius, Cr...	.....	Naga, Chin-H.		
			....	I. B. C.		
		trochilus, Frey.	....	N. I.-B.		I am not sure that I have got the distribution of trochilus and putli quite right.
		putli. Koll.	..	Centr. I. S. C.		
Zizera	....	maha, Koll.	....	N & Centr. I.-Up. B.	.....	The arrangement of Zizera is more or less in accordance with Butter's revision (P.Z.S. 1900): in separating ossa I follow Swinhoe who states that its genitalia differ from those of maha. I am not sure that I have given the distribution of opalina, otis and indica correctly.
		ossa, Sw.	..	S.		
		opalina, Pouj.		S. B.	=zera, Faw.: marginata, Pouj.	
		lysimon, Hub.	....	I. B. C. Ni.	? better as lysimon karsandra, M.	
		gaika, Fab.	....	I. B. C. An.		
		otis, Fab.	....	N. I.-B. An.		
		indica, Murray.		Centr, I.-S. C.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.,*	*Notes.*
LYCÆNIDÆ—*contd.*		LYCÆNINÆ—*contd.*				
Everes ..	....	argiades ..	dipora, M.	N. I.-Up. B.	= diporides, Chp. argiades, Pall. Europe.	Dr. Chapman (T.E.S. 1903) states that argiades and parrhasius have different clasps and describes a third species, diporides, from Mandi (N.-W. Him). Swinhoe gives these 3 forms and also dipora as distinct species. Seitz only gives parrhasius as Indian.
			parrhasius, Fab.	S. C.		
		potanini, Alph.	....	S. B.		
		kala, DeN.	....	As.		
		moorei, Leech.	....	As.		There are a few specimens of E. moorei in the B.M. from the Khasi Hills (DeN. recorded it also, J.A.S.B. 1894): the Assam form differs from Chinese specimens in being smaller and darker, also the spots below show distinctly through above. Seitz puts moorei in Lycæna; in appearance it is more like a Cyaniris or Chiladas.
Talicada ..	....	nyseus, Guér.	....	S. C.	.....	
			khasiana, Sw.	As.-Up. B	= khasia Druce.	Burmese specimens of nyseus differ a good deal from S. Indian specimens but Khasi specimens seem very much the same.
Catachrysops.	....	strabo, Fab.	....	I. B. C. An. Ni.		In J.A.S.B. 1895 DeNicéville considered C. strabo and lithargyria to be separate species: Swinhoe keeps them separate.
		lithargyria, M.	....	As.-B. C. An.		
		pandava, Hors.	....	I. B. C.	.....	
		cnejus, Fab.	....	I. B. C.		
Azanus ..	....	ubaldus, Cr.	....	I. B. C.		
		uranus, But.	....	I.	? d.s.f. of ubaldus.	
		jesous ..	gamra, Led..	I. B. C.	jesous, Guér, Africa.	
Tarucus ..	....	theophrastus, Fab.	....	I. C.		
			venosus, M.	N.-W. Him.	? worth separating.	
		plinius, Fab.	....	I. B. C.		
Castalius ..	....	rosimon, Fab.	....	I. B. C. An.-Ni.		
		ananda, DeN.	....	Sik.-B. S.		
		ethion, Db. and Hew.	....	As.-B. S. C.		
			airavati, Doh.	Ni.		
		roxus, God.	....	S. B. An.		
			roxana, DeN.	Up. B.		
			manluena Fd.	Ni.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—*contd.*		LYCÆNINÆ—*contd.*				
Castalius —*contd.*	....	decidia, Hew.	....	Sik.-B. Centr. I. S-		
		elna, Hew.	....	Sik.-B. Oriss. An.		
Niphanda.	....	cymbia, DeN.	....	Sik.-As.		
			marcia, Few.	B.		
Orthomiella.	....	pontis, El.	....	Sik.-B.		
Lycænesthes.	....	emolus, God.	....	Sik.-B. Beng. N. Kan- An.	.....	The representative of L. emolus in the Palni Hills is very distinct, and I propose to call it *topa*; it is smaller than emolus, the border is broader on the forewing; below the bands are filled in with darker colouring as in Nacaduba cœlestis, the markings are more regular, the discal band on the forewing is formed of almost separated spots, that in space 4 being transverse; the marginal lunules are prominent; the sub-anal ocellus is all black and there are 2 small black spots at the anal angle; the ciliated tails seem absent. I have one specimen and there is one specimen in the Bombay N. H. S. museum.
			topa, Ev.	.. Palni, H.		
Nacaduba,	....	lycænina, Fd.	....	Sik.-B. Beng. S C.		
		viola, M. ..	....	Sik.-B. S.C. An.		
		kerriana, Dist.	....	S. B.		
		macropthalma, Fd.	....	Sik.-B. S.C. An. Ni.	.....	I have only seen macropthalma from Sikkim, Up. Burma; there seems to be a good deal of confusion between this species and pavana: the small andaman form of pavana is nearest the battered relics of Horsfield's types. The common S. Indian species of this type is nearer true pavana than to macropthalma. DeN. and Bing. do not give pavana from South India or Ceylon.
		pavana. Hors.	....	Sik.-B. S.C. An.	according to Swin. this is Felder's hermus.	
		bhutea, DeN.	....	Sik.-Up. B.		
			kodi, Ev.	.. Palni H.		
		ancyra, Fd.	....	As.-B. Ni.		
		dana, DeN.	....	Kum.-B. Beng.S.		
		hampsoni, DeN.	....	Muss. C. I. Nilgiris.		
		sivoka, Ev.	....	Sik. B. An.	There are specimens of this in the B. M. from Bhutan, Tenasserim and Malacca.	
		nora, Fd...	....	I. B. C.	adima, Rhé Phil. I an ab.	I believe with various other writers that nora and noreia are separate species; nora, the tailed form, is often yellow below.
		noreia, Fd.	....	I. B. C.	=ardates, M.	
		coelestis, DeN.	....	Kum.-Up. B.-An.		
		atrata, Hors.	....	Sik.-B. S. C Ni.	=kurava, M.	prominens,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		LYCÆNINÆ—*contd.*				
Nacaduba—*contd.*	....	plumbeomicans, WM and DeN.	....	Sik.-S. C. An.	.....	There seems a good deal of confusion between atrata and plumbeomicans; DeN. gave the latter from S. Burma and the Andamans; Swin. and Bing. extended the range to Sikkim. In S. India 2 species certainly occur and one seems to be plumbeomicans or a race of it. N. atrata was described from Java and prominens from Ceylon is certainly a synonym; the types of kurava seems to have disappeared.
			nicobarica,..	Ni.		
Lampides..	....	bochus, Cr.	....	I. B. C. An.	.....	Swin. gives conferenda, But., as a separate species; I am convinced that it is only the dry season form of celeno.
			nicobarica, WM. and DeN.	Ni.		
		coruscans. M.	....	C.		
		lacteata, DeN.	....	C.		
		subdita, M.	....	Ten.		
		pura, M.	....	As.-B.	Swin.as cleodus.Fd.	L. cleodus is a Philippine insect; it is a different butterfly from pura but the forms may be conspecific.
		celeno, Cr.	....	I. B. C.	=conferenda, But.	
			kinkurka,Fd.	Ni.		
		cœrulea, Sw.	....	As.-B.	=bochides, DeN.	
		elpis, God.	....	I. B. C.		
			kankena, Fd.	Ni.	=rogersi, Bing.	
		kondulana. Fd.	....	Ni.		
Polyommatus.	....	boeticus, L.	....	I. B. C. An. Ni.		
LYCÆNIDÆ.		PORITIINÆ.				
Poritia ..	(Poritia).	hewitsoni. M.	....	Kum.-As.		
			tavoyana, Doh.	As.-B.	=geta, Faw.	
		sumatræ, Fd.	....	S. Ten.		
		pleurata, Hew.	....	S. B.		
		phraatica, Hew.	....	S. B.		
		erycinoides. Fd.	....	Up. B.		
	(Simiskina).	phalia, Hew.	....	Ten.		
		pedjada, Hew.	....	Ten.		
		phalena, Hew.	....	As.-Up. B.	=harterti, Doh.	
Zarona ..	....	jasoda. DeN.	....	S. B.	=zanella, DeN.	
Cyaniroides	....	libna, Hew.	....	Mergui.	=(Logania) anderson, M.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—*contd.*		CURETINÆ.				
Curetis ..	....	thetis, Drury.	....	S. C.	=? arcuata, M.	The forms of Curetis are puzzling. Of arcuata there is in the B. M. only one male from Malabar, the locality may be wrong; the specimen resembles a small gloriosa. The races of thetis seem well defined; nicobarica female is very distinct, on the forewing there is a small dark yellow patch, on the hindwing a diffused white subcostal patch.
			gloriosa, M.	As.-M.		
			saronis, M.	An.		
			nicobarica, Sw.	Ni.		
		bulis., Db. and Hew.	....	I. P.	.....	C. bulis has not developed into definite races like thetis; malayica with a yellow female seems separate; angulata and discalis are well defined varieties. C. felderi is not Indian.
			(v. angulata, M.)	....	=dentata, stigmata, M.; sperthis. Fd.	
			(v. discalis, M.)	....		
			malayica, Fd.	Rangoon-Ten.		
		THECLINÆ.				
ephyrus..	....	khasia, DeN.	....	As.		
		ataxus, Db. and Hew.	....	Murree-Kum.		
		duma, Hew.	....	Sik.-Naga Hill.		
		zoa. DeN.	....	Sik-Naga Hill.	.....	Maj. Tytler at Manipur has recently obtained several specimens of Z. zoa: DeNiceville in his "Butterflies of Sikkim" considered the only specimen then known to be an aberration of duma.
						Z. mandara should, I think, be dropped; The only known specimens are in the United States; it may be an aberration of icana or dohertyi.
						Swinhoe substitutes Ruralis for Zephyrus and calls the subfamily Ruralinæ.
		letha, Wat.	....	Chin.		
		birupa, M.	....	Simla-Kum.		
		syla, Koll.	....	Chit.-Sik.	=triloka Hannyngton.	
		ziha, Hew.	....	Simla-Muss.		
		pavo, DeN.	....	Bhut.		
		icana, M.	....	Simla-Kum.		
		dohertyi, DeN.	....	Simla-Kum.		
Chæto-procta.	....	odata, Hew.	....	Chit.-Kum.		
Euaspa ..	....	milionia, Hew.	....	Murree-Kum.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		THECLINÆ—*contd.*				
Neolycæna.	....	sinensis, Alph.	....	Bal.		
Thecla ..	....	sassanides, Koll.	....	Bal.-Chit.		
Callophrys.	....	rubi, L. ..	.. .	Muss. Chit.		
Satsuma ..	....	leechii, DeN.	....	Khasi H.		
Ilerda ..	....	sena, Koll.	....	Chit.-Kum.		
		epicles, God.	....	Kum.-Up B.		
		kohimensis, Tytler.	....	Naga-H.		
		tamu, Koll.	....	Chit.-Kum.		
		viridipunctata, DeN.	....	Kum.-Sik.	.....	Some Chinese specimens of viridipunctata are very like kala.
			kala, Tytler.	Naga-H.		
		androcles, God.	....	Kash.-Kum.	.....	The Eastern form of androcles has the green colour of a conspicuously more brassy tint; I propose to call it *viridis*. I believe that moorei ought to be put as a race of androcles.
			viridis, Ev...	As.-Up. B.		
		moorei, Hew.	....	Sik.-Bhut.		
		brahma, M.	....	Kum.-Up.B.	=hybrida, Tyt., a cas ab.	
Chrysophanus.	....	phlæas, L.	....	Bal.-Chit.-Kum.	=timeus, Cr., stygianus, But.	
		pavana, Koll.	....	Kash.-Kum.		
		solskyi	.. aditya, M. ..	Chit.-Lad.		
		kasyapa, M.	....	Chit.-Muss.		
		caspius ..	susanus, Sw.	Bal.	.....	C. sarthus and transiens, Std., are races of caspius from Turkestan and the Pamirs.
			evansii, DeN.	Chit.		
		tseng, Ober.	....	Shan St.	=mandersi, El.	
Aphnæus ..	(Cigaritis)..	acamas ..	hypargyrus, But	Cutch. Bal.-Chit.	M....	In Palaearctic regions Aphnæus and Chrysophanus are closely allied.
	(Aphnæus).	vulcanus, Fab.	....	I		I think that all vulcanus like forms occurring in Ceylon should be regarded as fusca in Ceylon specimens the orange anal patch on the hind-wing below is not extended upwards along the dorsal margin as in continental specimens.
			fusca, M. ..	C.	=minima, But., a cas ab and greeni Heron, a cas ab.	
		gabriel, Sw.	....	Up. B.	.....	There is a good series of gabriel in the B. M.; it is quite a distinct form and represents vulcanus perhaps in Up. Burma.
		schistacea, M.	....	S.-C.		
		lilacinus, M.	....	U.P.-Malda, Bombay.		
			abnormis, M.	S.-C.		
		syama, Hors.	....	Sik.-B. Oris.	=peguana, M.	
		lohita, Hors.	....	Kum.-B. C.	S. =concanus, M.	
			zoilus, M. ..	S.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes
LYCÆNIDÆ—*contd.*		THECLINÆ—*contd.*				
Aphnæus —*contd.*	(Aphnæus) —*contd.*	ictis, Hew.	....	I. C.	rukmini, DeN. an ab.	A. ictis is an extremely variable species and when more material becomes available I think separate races from the Western and Eastern Himalayas and South India might be established.
			maximus, El.	S. B.		
		nipalicus, M.	....	Muss. Nep.	=zaffra, DeN.	A. nipalicus is allied to linacinus and schistacea; I have seen the type of nipalicus and have no doubt that zaffra is a synonym.
			sani, DeN. ..	Sik.-B.	rukma, DeN. an ab.	
		ARHOPALINÆ.				
Thaduka ..	....	multicaudata, M.	....	Ten. S.	.....	Mr. Bethune Baker (T.Z.S. 1903) gave a revision of this subfamily and I have followed him; I have included the genera Zinaspa and Mota as they seem best placed here.
Mahathala.	(Mahathala).	ameria, Hew.	....	Beng. As.-B.		
	Apporosa).	atkinsoni, Hew.	....	Ten.		
Iraota ..	....	timoleon, stoll.	....	I. B.	=mæcenas, Fab.	I am not sure that the South Indian form of timoleon ought not to be called nicevillei.
			nicevillei, But.	C.		
		rochana, Hors.	....	Mergui.		
Amblypodia.	....	anita, Hew.	.. .	I. B. C. An.	=naradoides, M. arracana, Cr. S., erichsonii, W. M. and DeN.	I do not think it is worth while to separate anita into races.
			(female v. darana, M.)	S. C.		
		narada, Hors.	....	An. Mergui.	=taooana, andersoni, M.	
Surendra..	....	quercetorum, M.	....	I. B. An.	=biplagiata, But. tatimargo, M.	
			discalis, M.	C.		
		amisena, Hew.	....	Ten.		
		florimel, Doh.	....	Ten.	=stimula, DeN.	
Zinaspa ..	....	todara, M.	....	S.	These two are very close.	
			distorta, DeN.	Sik.-B.		
Mota ..	....	massyla, Hew.	....	Bhut.-B.		
Arhopala ..	....	meander ..	constanceæ, DeN.	An.	.....	Moore has divided the Arhopala group into several genera but their adoption as sub-genera even seems useless as the species run into one another in every direction; even the construction of a key presents great difficulty as whatever character is taken, *viz.*, tails, colour, spots on the underside it seems hopeless to define natural groups. I have not had time to study this genus as much as I should have liked; the material so far available is very scanty.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ.—*contd.*		ARHOPALINAE—*contd.*				
Arhopala —*contd.*		centaurus, Feb.	....	E. Kum.-B.	=pirithous, M.	
			pirama, M.	S. C.	These seem worth separating.	
			coruscans, WM. & DeN.	An.		
		amantes, Hew.	....	I. C.An.		
			amatrix, DeN.	Up. As.-Up-B.		
		camdeo, M.	....	Sik.-B.		
		opalina, M.	....	As.	type seems unique.	
		bazaloides, Hew.	....	As.-B. S.	=bazalus, De N. nec., Hew.	
		albopunctata, Hew.	....	B.		
		alitæus. ..	mirabella, Doh.	Mergu.		
		mindanensis, B.B.	....	Mergui.		
		aida, DeN.	....	S.B.		
		vihara, Fd.	....	Up. Ten.		
		adorea, DeN.	....	Sik.-B.		
		dama, Sw.	....	Ten.		
		apha, DeN.	....	Ten.		
		adatha, Hew.	....	B.		
		silhetensis, Hew.	....	Sik.-B.	=arama, DeN.	
		nicevillei, B.B.	....	Sik..B.		
		anthelus. Db. & Hew.	....	Ten.		
		subfasciata, M.	....	Ten.		
		anarte, Hew.	....	Cach.-B.		
		agaba, Hew.	....	Naga H.-B.		
		zambra, Sw.	....	Ten.		
		selta, Hew.	....	Ten.		
		aroa, Hew.	....	Ten.		
		rafflesii, DeN.	....	Ten.	=pseudomuta, DeN. nec Hew. and amphimuta Dist. nec Fd.	
		atosia ..	aricia, Std...	Ten.		
		epimuta, M.	....	Ten.		
		moolaiana, M.	....	Ten.	=pastorella, Doh.	
		antimuta, Fd.	....	Ten.	=davisonii, DeN	
		hypomuta, Hew.	....	Ten.		
		metamuta, Hew.	....	Ten.		
		oberthuri, Std.	....	Ten.		
		alesia, Fd.	....	An. B.	=wimberleyi, DeN.	
		eumolphus, Cr.	....	Sik-As.	.....	Bethune Baker unites all the races, of eumolphus; they are, however, very distinct.
			hellenore, Doh.	As.-B.	=viridissima, Sw.?	
			farquhari, Dist.	S. B.	=maxwelli, Dist.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—*contd.*		ARHOPALINÆ—*contd.*				
Arhopala —*contd.*	....	basiviridis, DeN.	....	B.		
		abseus, Hew.	....	Sik.-B. N. Kan. C.	.....	The Burmese form of abseus may prove to be worth separating when more specimens are available; it is near irregularis, Snell.
		diardi, Hew.	....	As.-B.		
		fulgida, Hew.	....	Sik.-Up. B.		
		anniella, Hew.	....	Ten.		
		artegal, Doh.	...	S. B.		
		apidanus, Cr.	....	B.		
			ahamus, Doh.	Up As.		
		adriana, DeN.	....	Sik.-Up B.		
		asoka, DeN.	....	Sik.-B.		
		chinensis, Fd.	....	Sik-Up. B.	=mœlleri, DeN. lazula, M.	
		areste, Hew.	....	Nep.-As.		
		bazalus, Hew.	....	Sik.-B.	=teesta, DeN. turbata, But.	
		singla, DeN.	....	Sik.-Up. B.		
		antura, Sw.	....	Ten.	very near vihara or adorea.	
		agrata, DeN.	....	S. B.		
		medias, Hew.	....	B.		
		agnis, Fd.	....	B.		
		yendava, Gr. S.	....	B.	?=agnis, Fd.	
		khamti, Doh.	....	Up. As.		
		œnea, Hew.	...	Sik.-As.		
		rama, Koll.	....	Kash.-B.		
		atrax, Hew.	....	B.		
		hewitsoni, BB.	....	I. B.	=atrax A u ct nec Hew.	
		alemon, DeN.	....	B.		
		canaraica, M.	....	S.		
		alea, Hew.	....	I.?	locality doubtful.	
		dodonæa, M.	....	Chit.-Kum.		
		comica, DeN.	....	Bhamo.	.....	Bethune Baker places comica as a casual aberration of dodonæa, but as dodonæa has never been found east of Kumaon and comica was described from Burma this cannot possibly be the case.
		paramuta, DeN.	....	Nap.-B.		
		zeta, M. ..	....	An.		
		roona, M...	....	An.-Ten.	?=zeta, M.	
		agelastus, Hew.	....	Ten.	?=moolaiana M.	
		Sounguva, Gr. S.	....	B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ.—*contd.*		ARHOPALINÆ—*contd.*				
Arhopala. —*contd.*		perissa, Doh.	....	Ten.		
		asopia, Hew.	....	Ten.		
		aeeta, DeN.	....	Ten.	B.B. considers this to be an ab of asopia.	
		perimuta, M.	....	Sik.-B.		
		belphœbe, Doh.	....	As.-B.		
		duessa, Doh.	....	Ten.		
		ammonides, Doh.	....	Ten.		
		birmana, M.	....	S. B.	=arisba, DeN.	
		aberrans, DeN.	....	B.		
		paraganesa, DeN.	....	Kum.-Up.B.		
			zephyretta, Doh.	Up.-As.		
		ariel, Doh,	....	Up.-As.		
		ganesa, M.	....	Chit.-Kum.	.....	Watson described a race of ganesa from the Chin Hills in J B. N. H. S. x. but gave it no name; I propose to call it *watsoni*. I think ganesa, dodonæa and rama ought to be placed together.
			watsoni, Ev.	Up. B.		
		arvina, Hew.	....	Ten.	=abœ, DeN.	
		adala, DeN.	....	Ten.	=adulans, DeN.	
		fulla, Hew.	....	An.		
		andamanica, W. M. & DeN.	....	An. Ten.	=subfasciata, M.	
		DEUDORIGINÆ.				
Zesius ...	....	chrysomallus, Hüb.	....	Malda. Centr. I., S. C.	I have a curious male ab, which is blue above instead of copper.	Bingham includes what I have called the Deudoriginæ with the Theclinæ. I am not sure that it would not be preferable to restrict Deudoriginæ for the first portion and place every thing from Thamala onwards in a new sub-family which might be called Myrininæ.
Deudoryx.	....	epijarbas, M.	....	I. B. C. An. Ni.		
		diara, Sw.	....	Jaintia H.		
		gaetulia, DeN.	....	As.-B.		
		hypargyria, El.	....	Karen, H.	Elwes placed this in Rapala but makes no mention of any secondary sexual characters.	
Hysudra ..	....	selira, M.	....	Chit.-Kum.		
		hades, DeN.	....	Ten.		
Virachola..	....	isocrates. Fab.	....	I. C.		
		perse, Hew.	....	I. C.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—*contd.*		DEUDORIGINÆ.—*contd.*				
Virachola. —*contd.*	....	smilis, Hew.	....	An.		
Rapala ..	....	deliochus, Hew.	....	B.		
		tara, DeN.	....	kum.-As.	=francesia, Sw.	
		sphinx, Fab.	....	Syl.-B.	=nicevillei, Sw. a darker form.	
		scintilla, DeN.	....	Sik.		
		lankana, M.	....	S. C.		
		schistacea, M.	....	I. C.		
		abnormis, El.	....	Karen H.		
		buxaria, DeN.	....	Sik.-Up. B.		
		rosacea, DeN.	....	Sik.-As.		
		nissa, Koll.	....	Kash.-B.	=rectivitta, M. maculata, Seitz. subpurpurea, Leech.	
		ranta, Sw.	....	Jaintia, H.		
		varuna, Hors.	....	I. B. C. An.	=orseis, Hew. grisea and lazulina, M.	R rogersi is much larger than varuna; some specimens from Burma are equally large.
			rogersi, Sw.	Ni.		
		subguttata, El.	....	Karen, H..		
		refulgens, DeN.	....	Khasi H.-Nep.		
		petosiris, Hew.	....	Sik.-B. oriss.		
		suffusa, M.	....	Syl.-B.	=testa, Sw. barthema, Dist.	
		melampus, Cr.	....	I. C.		
		jarbas, Fab.	....	Sik.-B.	Seitz. as a race of melampus.	
		xenophon, Fab.	....	Beng. As.-B.	=dieneces, Hew. damona, Sw.	
			intermedia, Std.	An. Ni.		
Sinthusa ..	....	nasaka, Hors.	....	Kangra.-As.		
			amba, Kirby.	B.		
		chandrana, M.	....	Kum.-Up-B.		
		virgo, El...	....	Sik.-B.		
Listeria ..	....	dudgeoni, DeN.	....	Muss.-Bhut.	.....	Listeria is rather a peculiar genus; I am not sure that it would not be better placed in the Theclinæ.
Dacalana ..	....	vidura ..	burmana, M.	S. B.		
Arrhenotrix.	....	penicilligera, DeN.	....	As.-B..		
Camena ..	(Camena) ..	cotys, Hew.	....	Nep.-B.		
		ctesia, Hew.	....	Kum.-As.		
		argentea, Aurivill.	....	Sik.-B.-S.	=cippus Auct, nec Fab.	
		lcetas, Hew.	....	Dalhousie-B.		
		deva, M. ..	....	I.B. C.	=lila, M. (?race from N. I).	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, etc.*	*Notes.*
LYCÆNIDÆ—*contd.*		DEUDORIGINÆ—*contd.*				
Camena. *—contd.*	(Camena) *—contd.*	carmentalis, Den.	....	Sik.-B.	.....	I think ister should be dropped, it seems to be a female aberration of cleobis. Swinhoe states that it is the female of what DeN. described as carmentalis; he may be right but the two insects are very dissimilar. I have a female ab of cleobis from the Nilgiris very similar to the type of ister in the B.M.
		icetoides, El.	....	Karen, H..		
	(Creon) ..	cleobis, God.	....	I.	=ister, Hew, ? a female ab.	
	(Maneca) ..	bhotea., M.	....	Sik.		
	(Creusa) ..	culta, DeN.	....	As.		
Ops ..	(Ops) ..	ogyges, DeN.	....	Ten.		
		oeta, DeN.	..	Ten.		
		melastigma, DeN.	....	Sik. B.-S.		
	(Britomartis).	cleoboides. El.	..	Sik-B.		
	(Bullis) ..	buto, DeN.	....	Ten.		
		valentia, Sw.	....	Khasi H.		
Tajuria ..	(Tajuria) ..	longinus. Fab.	....	I. B. C.	=cippus, Fab.	
		jehana, M.	....	I. C.		
		nela, Sw. ..	....	Jaintia H.		
		diaeus, Hew.	..	Muss-As.		
		thyia, DeN.	....	Sik.-As.		
		albiplaga, DeN.	....	Sik.		
		tyro, DeN..	....	B.		
	(Remelana).	yajna, Doh.	....	Muss-Bhut.	=istroidea, DeN.	
		megistia, Hew.	....	As.		
		teza, Sw.	....	Jaintia H.		
		thria, DeN.	....	Ten.		
		donatana, DeN.	....	Ten.		
		mantra, Fd.	....	Ten.		
		jangala. ..	ravata, M. ..	Sik.-B.	jangala, Hors., Java.	
			andamanica, W.M. & DeN.	An.		
	(Cophanta).	illurgis, Hew.	....	Muss-B.	.....	There are several specimens of luculenta, Leech (described from Omei Shan) in the B.M. from the Khasi Hills; it is very similar to illurgoides and may be a local race of the latter species; it differs in having a large extent of pale cœrulean blue above.
		illurgoides, DeN.	....	Kum.-Up. B.		
		luculenta, Leech.	....	Khasi		
		maculatus, Hew.	....	Sik.-B.S.		
		jalindra ..	indra, M. ..	Sik.-As. Beng. S.		
			tarpina, Hew	An.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—*contd.*		DEUDORIGINÆ.—*contd.*				
Hypolycæna.	....	erylus, Gcd.	....	Sik.-B. An.	=andamana, M.	
		thecloides, Fd.	....	Ten. Ni.		
Chliaria ..	....	othona, Hew.	....	Muss.-B. S.		
		kina, Hew.	....	Muss.-B.	=cachara, M., an exact synonym.	
		nilgirica, M.	....	S. C.		
		morguia, Doh.	....	Ten.	=watsoni, Sw.	
Thamala ..	....	miniata, M.	....	B.		
Sithon ..	....	nedymond, Cr.	....	Ten.		
Araotes ..	....	lapithis, M.	....	Sik-B.		
Biduanda..	....	thesmia, Hew.	....	Ten.	=fabricia, M.	A number of different Biduandas are recorded from Tenasserim; there are only specimens of melisa and thesmia in the B. M-
		scudderii ..	....	Ten.		
		melisa, Hew.	....	Bhut.-B.		
		cyara, Hew.	....	Sik.		
		nicevillei, Doh.	....	Ten.		
Marmessus.	....	lysias, Fab.	....	B.	=boisduvalii, M.; moorei, Dist. is from the Malay Peninsula.	M. lysias is recorded from the Nicobars but DeNiceville considered it to have been an error.
Suasa .	....	lisides, Hew.	....	As.-B.		
Neocheritra.		amrita, Fd.	....	S. B.		
		fabronia, Hew.	....	Sik.:Up.B.		
Manto ..		martina, Hew.	....	Ten.		
Eoxylides.		tharis, Hüb.	....	B.		
Cheritra ..		freja, Fab.	....	E.Kum.—B.	.....	The Ceylon race of freja differs from jaffra only in size.
		jaffra, But. ..		S. C.	=? pseudojaffra M. Ceylon.	
Ticherra ..		acte, M. ..	....	E. Kulu-B.		
Cheritrella.		truncipennis, DeN.	....	Sik-B.		
Zeltus ..		etolus, Fab.	....	Sik-B. S.		
Bindahara		phocides, Fab.	....	Beng. As.-B. An.	=ines Sw. (Andamans).	
		areca. Fd. ..		Ni.	=kamorta, Fd.	
		sugriva ..	moorei, Fruh.	S. C.	sugriva, Hors, Java.	
Loxura ..		atymnus, Cr.	....	N. I. B. Ni.		
		surya, M. ..		S.		
		arcuata, M...		C.		
		prabha, M. ..		An.		
Yasoda ..		tripunctata, Hew.	....	Sik.-B.		
Ritra ..		aurea, Druce.	....	Ten.		
Neomyrina.		hiematis, God. &Salv.	....	Ten.		
Drina ..		donina. Hew,	....	B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
LYCÆNIDÆ—*contd.*		DEUDORIGINÆ—*contd.*				
Charana ..		mandarinus, Hew.	....	Sik.-B. An.		
			cepheis, DeN.	Cachar.		
Lehera ..	....	eryx, L. ..	....	Sik-B.		
		skinneri, W.M. and DeN.	....	Cachar-Khasi.		
Catapæcilma.	....	elegans, Druce.	....	Muss.-B.S.C.		
		subochracea, El.	....	Karen, H.		
		delicatum, DeN.	....	Sik.		
Rathinda..	....	amor, Fab..	....	As.-Oriss, S.C.		
Horaga ..	....	onyx, M. ..	....	Dalhousie-B. Oriss. S. C.		
			cingalensis, M.			
		moulmeina. M.	....	Sik.-B	=sikkima, M.	H. moulmeina only differs from onyx in being ochreous below instead of dull brown.
		rana, DeN.	....	An.	=andamana, M.	
		viola, M. ..	....	Kangra-Sik. S.		
		albimacula, W. M. and DeN.	....	An.		
		LIPHYRINÆ.				
Liphyra ..	....	brassolis, Wd.	....	Sik. B.		
HESPERIIDÆ.		HESPERIINÆ.				
Orthopætus.	....	phanæus, Hew.	....	B.	.....	The Hesperiidæ have been arranged in accordance with Elwes and Edwards revision (T.Z.S. 1897); the Ismeninæ have been separated as done by Mabille in the Macrolepidoptera. I have given a full synonomy.
		lalita, Doh.	....	B.		
		lidderdali, El.	....	Bhut.		
Capila ..	....	jayadeva, M.	....	Sik.-B.		
		zennara, M.	....	Sik.-B.	The S. Burma form differs slightly.	
Calliana ..	....	pieridoides, M.	....	Bhut-As.		
Crossiura..	....	pennicillatum, DeN.	....	As.		
Hantana ..	....	infernus, Fd.	....	C.		
Achalarus.	....	bifasciatus.	liliana, Atk..	As.B.	bifasciatus, Leech, China.	
			casyapa, M...	Kash-Kum.		
Charmion..	....	ficulnea, Hew.	....	B.	=signata Druce, leucographa, Pl.	
Celænorrhinus.	....	pero, DeN.	..	Kangra-As.		
		pulomaya, M.	....	Kangra-As.	=lucifera, Leech.	
		aspersa, Leech.	....	As.-B.	=clitus, DeN.	
		ambareesa, M.	....	Beng.-As.		
		flavocincta, DeN.	....	Bhut.		
		sumitra, M.	....	Sik.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ - *contd.*		HESPERIANÆ - *contd.*				
Celænorrhinus. —*contd.*	....	pyrrha, DeN.	....	Kum.-B.	=patula, plagifera, DeN.: pluscula, Leech.	Pyrrha seems a good species, differing from sumitra in having prominent discal spots on the hindwing above; sumitra is a good deal larger and only bears a series of marginal spots on the hindwing.
		maculicornis, El. & Ed.	....	As.		
		leucocera, Koll.	....	I. B. An.	=putra, M., leucocicirca, El.	
		munda, M.	....	Kulu-Sik.		
		spilothyrus, Fd.	....	Sik.-S. C.	=ruficornis, Mab.? area, Plötz.	
		fusca, Hamp.	....	S.	.....	C. fusca can easily be separated from spilothyrus by the chequered cilia.
		chamunda, M,	....	Sik.-Up. B.		
		nigricans, DeN.	....	Kulu.-B.		
		asmara, But.	....	As.-B.	=cacus, consertus, DeN.; goto, Mab. palajava, Std.	
		dhanada, M.	....	Muss. B.		
		andamanica, W.M. and DeN.	....	An. Ni.		
		zea, Sw. ..	....	Khasi H.		
		affinis, El. and Ed.	....	As.-B.		
		aurivittata, M.	....	As.-B.		
		badia, M...	....	Sik.-As.		
Cnaiolade	....	indrani, M.	....	Muss.-B	.....	C. tissa is the plain form of indrani; some specimens of indrani from Burma are very pale.
		tissa, M.	..	Beng. Cetr. I.-S. C.	=lankae, Pl.	Sikkim specimens of dan are very light, but the species is extremely variable.
		dan, Fab...	....	Kash.-B. S.		
		laxmi, DeN.	....	Sik.-B.	=fatih, Koll; cacus, Lat.; dea, Leech; dichroa, Pl.	
		agni, DeN.	....	Sik.-B.		
		agnioides, El. & Ed.	....	As.		
		buchananii, DeN.	....	Up. B.		
		hamiltoni, DeN.	....	As.		
Tapena ..	....	thwaitesi, M.	....	Oriss.-B. C.		
		minuscula, El. & Ed.	....	B.		
		hampsoni, El. & Ed.	....	S.		
Ctenoptilum.	....	vasava, M.	....	Muss.- B.		
		multiguttata, DeN.	....	B.		
Odontoptilum.	....	angulata, Fd.	....	I.-B.	=sura, M.	
		pygela, Hew.	....	S.B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—*contd.*		HESPERIINÆ—*contd.*				
Caprona ..	...	ransonnettii, Fd.	....	I.-C.	=taylorii. DeN.	C. saraya is almost certainly a variety of taylorii the d.'s. f. of ransonnettii. I have specimens agreeing with saraya from the Dun. C. alida and ransonnettii seem to run into one another. There is a specimen in the B. M. marked 'kuki, Bing., Looshai Hills, to be described in part III Butterflies, Fauna of India"; until more specimens are obtained it should be regarded as an ab. of alida.
			alida, DeN...	Up.-B.	kuki, Bing., an ab.	
		syrichthus, Fd.	....	I. B.	=agama, M., elwesii, Wat.	I have caught specimens of syrichthus in the Palni Hills smaller than elwesii, Wat.
Tagiades ..	....	helferi, Fd.	....	Ni.	=noctis.	
			ravi, M. ..	Beng. Sik-B. An.	.....	The form khasiana of ravi, with more or less white on the hindwing below is merely seasonal.
		alica, M. ..	....	Cash-As.-B. An.	=athos, Pl.; meetana, M.	The alica-gana group is rather confusing. T. alica was described from the Andamans and is inseparable from athos, Pl. from Sylhet; meetana, M. is from Tenasserim and is rather paler. T. distans (=? obscurus Mab, Java) was described from Calcutta and differs somewhat from alica, the translucent spots on the forewing are prominent and the upper black discal spot on the hindwing below is well separated from the lower spots and not in line with them. T. gana was described from Java and only differs from alica in having a large snow white area on the hindwing above. Indian specimens are smaller: there are in the B. M. specimens of gana from Ceylon, which ought, I suppose, to be referred to distans. I have placed alica distans and gana as separate species following Elwes, but I think that they will eventually prove to be races of a single variable species.
		distans, M.	....	Beng. S. C.	=? obcurus, Mob.	
		gana, M. ..	....	Sik.-B.	=menanto, Pl.?	
		lavata, But.	....	Ten		
		atticus, Fab.	....	I. B. C. an.	=menaka, M.; calligana, But.; litigiosa, Mosch.	
		nana, El. & Ed.	....	As.-B.		
		dealbata, Dist.	....	As.-B.		
		trichoneura, Fd.	....	Syl.-B.	doubtfully separate.	
		pralaya, M.	....	Sik.-B.	doubtfully separate.	
		pinwilli, But.	....	As.-B.		
		tabrica, Hew.	....	Sik.	?race or ab of pinwilli.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—*contd.*		HESPERIINÆ—*contd.*				
Satarupa ..	....	gopala, M..	....	Sik.-B.		
		bhagava, M.	....	Sik.-B. Oriss. S. An.		
			andamanica, W M & DeN.			
		narada, M.	....	Sik. B.	=? diversa, Leech.	S. diversa is recorded from Assam; it is very near narada and may be the Chinese race; all the Assam specimens I have seen of this variable form are narada.
		phisara, M.	....	Sik.-B.		
		sambara, M.	....	Sik.-As.	=corinna, Pl.	
			dohertyi, Wat.	Muss. Kum.		
			affinis, Druce.	B.	=cognata, Druce and? niphetes, Weymer.	
Odina ..	....	decoratus, Hew.	....	Syl.-B.		
		ortygia, DeN.	....	Ten.		
Darpa ..	....	hanria, M.	....	Muss.-As.		
Sarangesa.	....	purendra, M.	....	Kulu-Kum. Centr. I-S.		
		sati, DeN.	....	Cutch. C.P.?		
		dasahara, M.	....	Kangra.-B. Centr. S.		
		albicilia, M.	....	C.	=sezendis, Pl.	
Carcharodus.	....	altheæ, Hub.	....	Bal.:Chit.	=marrubii, H.S.; booticus, Ramb.	
		alceæ, Esp.	....	Bal.-Chit.-Kash.	=malvarum, God.; dravira, M.; swinhoei, Wat.	
Hesperia ..	....	galba, Fab.	....	I. B. S.	=superna, M.; evanidus, But.	H. evanidus does not seem separate from galba; zebra seems quite distinct.
		zebra, But.	....	Punjab.	=hellas, DeN.; nanus, Trimen.	
		orbifer, Hub.	....	Chit.	.....	Chitral specimens of orbifer are near lugens, Std., Thian Shan, a variety not given in Elwes and Edwards: the species is extremely variable and runs into sao Berg.
		phlomidis.	geron. Wat ..	Bal.	phlomidis, H. S., Asia Minor.	
		poggei, Led.	....	Bal.		
		alpina, Ersch.	....	Chit.	.....	Typical alpina occurs in Chitral; Kashmir specimens have all the markings very reduced; the two forms were both described in 1874.
			cashmirensis, M.	Kash.-Kum.	=durwazica, Cr.	
Thanaos ..	....	marloyi, Bdl.	....	Chit.	.....	Chitral specimens of marloyi are much darker than those in the B. M. from other localities.
Gomalia ..	....	albofasciata, M.	....	Kangra-S. C. Bal. Sindj	=littoralis, Swin.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*		PAMPHILINÆ.				
Pamphila..	....	avanti, DeN.	....	Kum.Sik.		
		dieckmanni, Grœser.	....	As.-Up. B.	=demea, Ober.; gemmatus, Leech.	
Baracus ..	....	vittatus, Fd.	....	C.		
		subditus, M.	....	S.		
			Septentrionum, WM. & DeN.	Sik.-B.	.....	The so called septentrionum recorded from the Nilgiris is really the d. s. f. of subditus.
		hampsoni, El. & Ed.	....	S.		
Sancus ..	....	pulligo, Mab.	....	Cach.-B.S.	=ulunda, forensis, kethra, Pl.; subfasciata, M.	
Astictopterus.	....	olivascens, M.	....	Kum-B. Beng. S.	=chinensis, Leech; melania, Pl.	A. jama, Fd., Sumatra, is a very obscure form; Felder compared it with Aeromachus indistincta and the female type is said to=koruthaialos butleri female.
		henrici, Bdl.	....	As.-B.	=kada, Sw.? nubilus, Mab.	
Koruthaialos.	....	xanites, But.	....	B.		
		rubecola, Plötz.	....	Naga B. ..	=hector, Wat.; gemmifer, But.; palawites, Std.	
		butleri, WM.& DeN.	....	Sik.-B.		
Suada ..	....	swerga, DeN.	....	Sik.-B.		
Suastus ..	....	gremius, Fab.	....	I. B. C.	=raika, Pl.; subgrisea and divodasa, N.; robsonii, DeN., an ab.	Robsonii is merely a starved aberration of gremius; I have a specimen from Jabalpur and two dwarfed specimens of gremius (also from Jabalpur) rather near robsonii.
		aditus, M.	....	Sik.-B. Beng.-An.	=sala, El. and Ed.; nec. Hew.	S. aditus is usually put as a synonym of sala, Hew.; sala is, however, a very different form and put here under Pedestes.
		bipunctus, Sw.	....	S.		
		minuta, M.	....	C.	=sinhalus, Pl.;	
Taractrocera.	....	maevius, Fab.	....	I. B.	=flaccus, Fab.; sagara, M.	The Ceylon form of maevius has not the veins on the hindwing below conspicuously pale as in continental specimens.
		danna, M..	....	Simla.-As.		
	....	ceramas, Hew.	....	S.	=silhetica, Pl.	
			nicevilleii, Wat.	Bombay ..	=coras, Auct; nac, Cr.	
			oberthuri, El. & Ed.	Trichinopoly-Animalai H.		
		atropunctata, Wat.	....	Up. B.		
		archias, Fd.	....	Ten.	.....	T. archias is rather like A. maro above, and below like T. dara.
		ziclea, Pl..	....	B.	=mæsoides, Std.; luzonensis, Mab.	T. ziclea is exactly like small specimens of T. dara that have no black spotting below; the only difference is the antennæ which in ziclea have a spatulate club, yellow coloured below; in dara the club is all black and has a terminal crook.
Ampittia ..	....	maro, Fab.	....	I. B. C.	dioscoroides, Fab.; camerta, M.; lynx, Mösch; palemonides, Pl.	
		maroides, DeN.	....	Ten.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Jambrix ..	....	salsala, M.	....	Sik.-B. S.C.	=luteipalpis, Pl.	
		stellifer, But.	....	B.		
Ochus ..	....	subvittatus, M.	....	Kum.-Up.B.	=subradiatus, M.	
Aeromachus.	....	stigmata, M.	....	Kangra-As.	....	There are practically no specimens of Aeromachus in the B. M. collection.
		discreta, Pl.	....	As.-B.		
		jhora, DeN.	....	Sik.-B.		
		dubius, El. & Ed.	....	S.		
		indistincta, M.	....	B.-S.	=pygmæa, M.	
		obsoleta, M.	....	As.		
		kali, DeN..	....	Sik.-B.		
Sebastonyma.	....	dolopia, Hew.	....	Sik.-B.		
Pedestes ..	....	masuriensis, M.	....	Muss.-Sik.		
		pandita, DeN.	....	Sik.-As.		
		sala, Hew.	....	Cachar.-B. S.	=submaculata, Std.	I was always under the impression that sala was the same species as aditus, but on examining Hewitson's type I found it to be what has usually been called submaculata; sala was described in Suastus, Elwes and Edwards placed submaculata in Plastingia and DeNiceville put the latter in Pedestes in his list of the N. Kanara butterflies. I defer to DeNiceville's opinion but in general appearance sala is very like Suastus gremius: it can be easily distinguished from gremius by the spotted apex of the forewing below.
Isma ..	....	protoclea, Hs.	....	S. B.	=iapis, DeN.	
Hyarotis ..	....	adrastus, Cr.	....	I. B. C.	=praba, M.; phœnicis, Hew.	
Arnetta ..	....	vindhiana, M.	....	Centr. I. S.	=nilgiriana, modesta, M.	
		atkinsoni, M.	....	Sik.-B.	=subtestaceus, khasianus, M.	
		binghami, Sw.	....	S. B.		
Itys ..	....	microstictum, WM. & DeN.	....	Cachar.		
Zographetus.	....	satwa, DeN.	....	Kum.-B.		
		flavalum, DeN.	....	Sik.		
		ogygia, Hew.	....	Sik.-B. S. An.	=flavipennis, DeN, d. s. f.	
		maculicornis, El. & Ed.	....	B.	? very near if not = P. sala, Hew.	
Scobura ..	....	phiditia, Hew.	....	B.	=martini, El. and Ed.	S. phiditia is usually placed in Suastus, but as it is generally believed to be the male of Scobura martini, I think it is better placed here.
		cephala, Hew.	....	Sik.-B.	=isota, Sw.	
		cephaloides, DeN.	....	As.-B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Acerbas ..	....	anthea, Hew.	....	Ten.	=tagiadoides, Mab.	
Erionota ..	....	thrax, L. ..	....	Dun.-B.	=lara, Sw.	E. acroleuca is given from Assam to Burma as well as from the Andamans, but continental specimens differ somewhat and are best regarded as small varieties of thrax.
			acroleuca, WM. & DeN.	An.	=hiraca, M.	
		batara, M.	....	B.	=attina, M; latreilei, Fd; cruda, HS.; anitta, Pl.	E. batara was formerly placed in a separate genus, Unkana.
Pudicitia .	....	pholus, DeN.	....	Bhut.-As.		
Gangara ..	....	thyrsis, Fab.	....	Sik.-B. Beng.-S. C.	=pandia, M.	
Paduka ..	...	lebadea, Hew.	....	Sik.-B. C. An.	=glandulosa, Dist.; subfasciata, M.; andamanica, WM. & DeN.	
Matapa ..	....	aria, M. ..	....	I. B. C. An.		
		purpurascens, El. & Ed.	....	As.-B.		
		druna, M...	....	Sik.-B. An.	=pulla, Pl.	
		sasivarna, M.	....	Sik.-B.		
		shalgrama, DeN.	....	Sik.-B.		
Kerana ..	....	diocles, M.	....	Kum.-B.		
Stimula ..	....	swinhoei, El. & Ed.	....	As.-B.	.....	S. swinhoei was first put in the genus Watsonia but the latter name was found to be preoccupied.
Pirdana ..	....	hyela ..	rudolphii, El. & DeN.	Sik.-B.	hyela, Hew.; Malay Penin.	
		distanti, Std.	....	B.	=pavona, DeN.	
Plastingia.	..	callineura, Fd.	....	B.		
		margherita, DeN.	....	As.-B.	? a race of callineura.	
		corissa, Hew.	....	Ten.	=drancus, Pl.; latonia, Std.; indrasana, El. & DeN.	
		noomi, DeN.	....	Sik.-B.		
		naga, DeN.	....	As-B.	=? tessellata, Hew.	
		idyalis, DeN.	....	S.B.	Placed by DeN. in Isma.	
Lotongus ..	....	calathus, Hew.	..	S.B	=maculatus, Dist.; parthenope, Weym.; aliena, Std.; zalates, sarus, Mab.; traviata, Pl.	
		zeus, DeN.	...	As.-B.		
		avesta, Hew.	....	B.	tamiata, Std.	
		sarala, DeN.	....	As.		
Creteus ..	....	cyrina, Hew.	....	Sik.-B	=parca, DeN.; meleagrina, Std.	
Zea ..	....	taprobanus, Pl.	....	? C.	=mythecoides DeN.	
Hidari ..		irava, M. ..	....	B.	=hypœpa, Hew.	
		bhawani, DeN.	...	B.		

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Pithauria.	....	murdava M.	....	Sik.-B.	I have a spotless ab. of this.	
		stramineipennis, WM. & DeN.	....	Sik.-B.		
		aitchisonii, WM.&DeN.	....	Cachar.-B.	=glauca, Std.	
Oerane ..	....	neæra, DeN.	....	S.-B.		
Notocrypta.	....	feisthamelii, Bdl.	....	I.B.C.	=curvifascia, Fd. alysos, albifascia, restricta, M.; volux, Mab.; clavata, Std.; rectifascia, Leech; varians, Maas.; chimaera, Pl.	N. restricta is often regarded as a different species from feisthamelii but I think they should be united.
		paralysos, WM. & DeN.	....	An.	? a race of feisthamelii.	
		basiflava, DeN.	....	S.		
		monteithii, WM. & DeN.	....	cachar.-B.	=singularis, Mab.	
Udaspes ..	....	folus, Cr.	....	I.B.C.		
Actinor ..	....	radians, M.	....	Chit.-Dun.		
Cupitha ..	....	purrea, M..	....	Sik.-B.	=tympanifera, M.; lycorias, Mab.	
Augiades ..	....	subhyalina, Br. & Gr.	....	Oriss. S.An. As.		
		siva. M. ..	....	As.-B.		
		brahma, M.	....	Muss.-Kum.	? a race of siva.	
Telicota ..	(Telicota)..	augias, L..	....	I. B. An.	.....	I have here followed Elwes as regards the synonymy of dara but with considerable doubt; De Niceville and Watson both placed mæsoides and pseudhmæsa as separate species occurring with dara. Kollars type specimen came presumably from the W. Himalayas, and is probably exactly the same as mæsa M., Kunawur, the small pale form, pale yellow below spotted with black. T. pseudomæsa is from Ceylon and is very like dara differing only in being a dark yellow orange below; it may be a race of dara but is not a distinct species. T. mæsoides was described from a Malacca specimen in poor condition with no antennæ it is like dara but darker, below it is dark yellowish red and the marks are not defined with black; there are similar specimens from South Burma in the B. M. I have not seen the types of the other "species" described. In the B. M. and in my own collection two forms stand out, a small form agreeing with the types mentioned and a large form whose name I do not know, but at present I do not see my way to do anything than consider all the Indian specimens as belonging to dara.
		bambusæ, M.	....	I. B. C.	=pythias, Mab.	
		palmarum, M.	....	Beng.-B.	=chrysozona, Pl.	
	(Padraona).	concinna, El. & Ed.	....	An.-Ni. S.		
		gola, M. ..	....	Sik.-B. Oriss. S. C. An.	=goloides, M.; akar, Mab.; locus, alfurus, fabriolata, Pl.	
		rectifasciata, El. & Ed.	....	Sik.-B.		
		dara, Koll.	....	I. B. C. An.	=mæsa, M.; mæsoides, pseudomæsa, But.; hataerus, Semp.; sunias, Fd.; flava, nitida, taxilus, trachala, zebra, Mab.; nala, zatilla, Pl.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Halpe ..	..	zema, Hew.	....	Sik.-B.	=ormenes, Pl.	
		cerata, Hew.	....	Sik.-B.		
		astigmata, Sw.	....	S.		
		hyrie, DeN.	....	Bhut-As.		
		kumara, DeN.	....	Sik.-Bhut.		
		knyvetti, El. & Ed.	....	Sik.		
		moorei, Wat.	....	Muss.-B. Beng.-S.An.	=teliga, Sw.	H. moorei is probably a race of ceylonica.
		ceylonica, M.	....	Oriss.-S.C.		
		homolea, Hew.	....	Sik.-B.	=marta, aucma, Sw.; palawea, Serup.	
		sikkima, M.	....	Sik.-As.	=wantona & perara, Sw.	H. sikkima with its unchequered cilia is different to homolea: the Assam form (wantona) seems rather smaller.
		hyrtacus, DeN.	....	S.	.....	There are some specimens belonging to Halpe in the B. M. from Ceylon and South Burma which belong to undescribed species but being only single specimens I do not think that they ought to be described until more are obtained.
		egena, Fd.	....	C.	=brunnea, Pl.	
		fusca, El ..	....	B.		
		sitala DeN.	....	S.		
		evershedi, Ev.	....	Palni H.		
		gupta, DeN.	....	Garhwal. As.		
		debilis, El. & Ed.	....	As.		
		aina, DeN.	....	Garhwal. As.		
		separata, M.	....	Kum. As.		
		albipectus, DeN.	....	Shan St.		
		masoni, M.	....	B.		
		honorei, DeN.	....	S.		
		decorata, M.	....	C.		
		ornata, Fd.	....	Cachar.		
Onryza ..	....	meiktila, DeN.	....	B.		
Iton ..	....	watsoni, DeN.	....	B.		
		semamora, M.	....	Sik.-B.	=barea, Hew.	
Parnara ..	(Baoris) ..	oceia, Hew.	....	Sik.-B. Beng Centr. I. C. An.	=farri, penicillata, scopulifera, M.; sikkima, Sw.; unicolor, M.	
	(Milena) ..	plebeia, DeN.	.....	Muss.-B. Oriss. S.	=mormo, Mab.	Plebeia, the only Parnara with a tuft of hair on the underside of the forewing deserves to be placed in a separate subgenus for which I propose the name *Milena*. Swinhoe's Caltoris does not seem worth retaining.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—*contd.*	PAMPHILINÆ—*contd.*					
Parnara. (Chapra) —*contd.*	..	brunnea, Snell.	....	B.	=cœre, DeN.; sodalis, Mab.	
		prominens, M.	....	Kangra.-B. Centr. I. S.	=midea, Walker; sinensis, Mab.; similis, Leech.	
		mathias, Fab.	....	I. B. C. An.	=thrax-Led; julianus Lat; larika, Pag; agna, subochracea, chaya, M., balarama, ella. Pl.	
	(Parnara)	philippina, HS.	....	S. C.	=seriata, M.	P. philippina and kumara are very close to one another; their genitalia were found to be different by Elwes and Edwards.
		kumara, M.	....	Sik. B. Beng.-S.C.	=saruna, Pl.	
		canaraica, M.	....	S.	.....	P. canaraica seems to be the only member of this group with spots on the hindwing below; the type female in the B.M. really belongs to conjuncta I think.
		aurociliata, El. & Ed.	....	Sik.		
		pagana, DeN.	....	Sik.B.Beng.	.....	The group pagana—cahira, all flying together, are difficult to recognise; pagana has a spot in 8 on the forewing; cahira on the forewing below has a suffused black discal patch; moolata is very like austeni, the former is deep warm brown below and the latter dark chestnut.
		moolata, M.	....	As.-B.	=dravida, Mab., female onchisa, Sw.	
		austeni, M.	....	Sik.-B.S.C. An.	=male onchisa, Sw.	
		cahira, M.	....	B.-An.		
		toona, M..	...	Kum.-B. S.	scortea, contigua (?), Mab.; Kolantus, Pl.; pellucida, Mur.?	The Assam form of toona has whiter spots, rather like pellucida, the Chinese race.
		eltola, Hew.	....	Kangra.-B.		
		discreta, El. & Ed.	....	Sik.-B.	.....	P. contigua, Mab. was put as a synonym of toona by Elwes but the specimens arranged over this name in the B.M. are the Javan form of conjuncta.
		guttatus, Br. & Gr.	....	Chit.-As.	=sifa, wambo, nandoa, Pl.; mangala, M.; fortunei, H.S.	
		bada, M. ..	....	I. B. C.	philotas, DeN. an ab.=haga, Pl. intermedia, H. S.	
		colaca, M..	....	I. B. C. An. Ni.	=ciingala, M.; urejus, Pl.	
		bevani, M.	....	I. B.	=? flexilis, Sw.; thyone, Leech.	
		assamensis, WM. & DeN.	....	Muss.-As.	=abie, Pl.	
		conjuncta, HS.	....	I. B. C. An.	javana, Mab.; narooa, M.; alica, Pl.	
		uma, DeN.	....	B.	I have not seen this.	
		tulsi, DeN.	....	Sik.-Up.B.	=jolando, Pl.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Genus	*Sub-genus.*	*Species.*	*Race.*	*Locality.*	*Synonyms, &c.*	*Notes.*
HESPERIIDÆ—*contd.*		PAMPHILINÆ—*contd.*				
Eogenes ..	....	alcides ..	lesliei, El. ..	Chit.	.....	In the B.M. there are several specimens, caught by me in Chitral, placed as Arnetta lesliei. El.; they are, however, very close to Eogenes alcides, differing in being darker, rarely having any cell spot in 1a on the forewing and in often having a discal spot on the hindwing below.
Gegenes ..	....	nostrodamus, Fab.	....	Bil.-Chit.-Dun. Panj.	=pumilio Hoff.; lefebrii, Kumb. pygmaeus, Hüb.: karsana, M.	
Erynnis ..	....	comma ..	dimila, M. ..	Chit.-Muss.	.....	Ladak specimens of dimila are very pale.
		ISMENINÆ.				
Ismena ..	..	ataphus, Wat.	....	Kangra-B. C.	=consobrina, Pl.; ? œdipodea, M.	I. œdepodea from Java has the body and bases of the wings above sprinkled with metallic blue green scales.
		tuckeri, El. & Ed.	....	Ten.		
		mahinth a, M.	....	Cachar- B.		
		jaina, M. ..	.....	Muss.-B.		
			fergusonii, DeN.	S.		
		otelka, Hew.	....	B.		
		harisa, M..	....	Sik.-B.		
		anadi, DeN.	....	Muss.-As.		
		vasutana, M.	....	Kum.-As.		
		amara, M..	.. .	Sik.-Up. B.		
		gomata, M.	....	Sik.-S.	lorquinii, Mab.	
Rhopalocampta.	...	benjaminii, Guer.	....	Kangra-B. S. C.	.....	Mackinnon in Mussoorie found that R. benjaminii has 2 forms of larva and Elwes (P.Z. S. 1891) pointed out that there seemed to be 2 forms of the imago, one with the green colour confined to the base, and the other green all over; this difference appears to be merely sexual and no further evidence seems forthcoming as to whether there are one or two species under this name.
		crawfurdi, Dist.	....	Ten.	=electra, Std.	
Badamia ..	....	exclamationis, Fab.	....	I. B. C. An. Ni.	=ladon, Cr., thymbron, Fd.	
Bibasis ..	....	sena, M.	....	I. B. C.		
Hasora ..	....	chuza. Hew.	....	As.-B.		
		coulteri, WM & DeN.	....	Cachar.		
		chabrona Pl.	....	Sik.-B. S.		
		butleri, Aurivill.	....	I. B. C.	chromus, Auct, nec, Cr.	
			malayana, Fd.	An.-Ni.		
		chromus, Cr.	....	B. S. C.	alexis, M.	
		simplicissima, M. ab.	....	B.	=philetas, Pl.	
		anura, DeN.	....	Sik.-As.		
		badra, M.	....	Sik.-B.S.C.	quadripunciata, Mab.	

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Postscript.

During a recent visit to Calcutta, I had an opportunity of examining the DeNicéville's collection and would like to make the following notes:—

Neptis melba.—There is a single specimen of this species in DeNicéville's collection labelled by him "*Neptis nyctea*, female type." I have examined the genitalia of my two specimens and find that they are both males. I believe DeNicéville's specimen is also a *melba*. The genitalia of *melba* differ from those of *narayana*, and *manasa* (= *nyctea*). In this connection it may be remarked that Oberthür, in "Etudes," 1906 (October), states that he has eleven specimens of *nyctea* and three of *manasa* from Sikkim: he considers that *nyctea* is a white marked race of *thisbe*, Leech (China) and that *manasa* is distinct species, the Chinese form of which he describes as *narcissina*.

Melitæa trivia mixta.—DeNicéville has labelled the specimens of this race, that I sent him, as "*mercea*, DeNicéville," but I do not think that he ever published a description of *mercea*.

Lycæna devanica gracilis.—Similarly DeNicéville has labelled this "*lysias*," but I have seen no description.

The range of *Dilipa morgiana* is given as 'Kulu.—Up. B", it should be "Murree—Up. B". Also the range of *Dodona egeon* should be "Kash—B" instead of "Kash.—As."

Errata in Part I.

P. 561, near top, "camaralzaman, But. and "crameri" to be shifted up one line: "crameri" should be opposite "bremeri."

P. 563, line 9, for "Philareta" read "Philarcta."

P. 564, line 6 from end, for "bolancica" read "bolanica."

P. 566, line 5, "drypetis, Hew.," to be shifted down one line, so as to be in the same line as ". . S. Oriss."

P. 570, line 13 from end, for "diadernoides" read diademoides."

P. 571, line 18, for "Croweay" read "Crowley."

P. 574, lines 7 and 8 from end, omit "eleanor, Fruh. S.B." and "pardalis, M. Mergui."

P. 577, line 4 from end, "columella, Cr." to be shifted down one line so as to be in the same line as "Dun—Up. B."

P. 578, line 7, "harita, M." to be shifted down one line so as to be in the same line as "E. Beng—B."

P. 573, line 10, "anjana, M." to be shifted to the left into the "species" column.

P. 578, line 9 from end, omit "ananta, M. . . . Chamba—B."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XVIII with Plate XVIII, Diagram and Map.

(Continued from page 475 of this Volume.)

The genus *Helicops* is one of many into which aglyphous colubrines, *i.e.*, colubrines without grooved or tubular teeth either in the front or back of the maxilla, are divided. It contains eleven species, which inhabit South Asia, Tropical Africa, and North and South America, but only one of these, *viz.*, *schistosus* occurs within Indian limits. The type is the Brazilian *H. carinicauda*.

HELICOPS SCHISTOSUS (Daudin).

THE OLIVACEOUS KEELBACK.

Our first introduction to this snake is through Russell who figured, and remarked upon it in 1801.*

Nomenclature (*a*) *Scientific.*—The generic name for which Wagler is responsible, dates back to 1830, and is from the Greek "elis," rolling, and "ops," eye, and seems to me specially suitable to our Indian representative, for I do not think I have ever observed another snake move its eyeballs so actively. The specific title given by Daudin in 1803 from the Latin meaning "slaty", was probably suggested by the dorsal colour of Russell's plate, or a spirit specimen. It is to my mind not appropriate, for in life the snake is olivaceous.

English.—The olivaceous Keelback seems to me a suitable name.

Vernacular.—Russell says it is known to the natives (on the Coromandel coast?) as "Chittee" which I am told is Telugu for

* Ind. Serp., Vol. II, Plate IV.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

little, and "Nalla wahlagillee pam." In Mysore it is known by the Canarese name "Barmnya."

General characters.—The head is chiefly remarkable for its short, and rather pointed muzzle. The shields are glossy. The nostril is slit-like and placed rather high, distinctly approaching the type seen in the true water snakes of the Family *Homalopsinæ*. It occupies about half the depth of the nasal shield, which is divided below it by a suture running to the 1st supralabial. The eye is lateral in its setting, rather small, the pupil round, and the iris speckled throughout with gold. The commissure of the mouth viewed in profile is seen to take a sudden bend upwards behind the eye. The tongue is plum-coloured. The neck is not very evident. The body is rather stout for the length of the snake, and the scales on the back are sharply ridged as in other Keelbacks. The tail is long, its relative length being nearly one-third the total length in males, but nearer one-fourth in females.

Dimensions.—My largest specimen is a ♀ measuring 2 feet 10¼ inches. Females attain a greater length than males, and I have had 7 measuring over 2 feet, but never a ♂ reaching this length. The average length of my 7 largest females is 2 feet 4¾ inches and that for my 7 largest males only 1 foot 10 inches.

Identification.—In colouring and general appearance it may be very easily confused with the water snake *Hypsirhina enhydris*, but bears a still more striking resemblance to *Rhabdops bicolor*. It is rather remarkable too that all these three snakes possess but a single internasal shield, a rare feature in lepidosis. If the lepidosis is studied its identification from all Indian snakes is easy. Three characters must coexist, and these are (1) a single internasal; (2) 19 costal rows in midbody, and 17 at a point two headslengths before the vent, and (3) 8 or 9 supralabials. The combination of the 1st and 2nd of these is only seen in two other Indian snakes, *viz.*, *Cantoria violacea* and *Hypsirhina plumbea* which have respectively but 4 and 5 supralabials.

Colour.—Though Boulenger says it is dorsally olive-brown, all the many specimens I have seen in life have been olive-green. This hue is uniform on the upper parts of the head, body and tail in adults, and abruptly ceases in the middle of the penultimate

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

row. Boulenger * says there is usually a more or less distinct dark lateral streak, and some specimens have two series of small black spots along the back, but I have never noted these. Günther† says that the young have a blackish streak from the orbit, continued along the fore part of the body. The lower half of the penultimate row of scales, the ultimate and the under parts of the snake are uniform yellow, sometimes of a very bright hue. Sometimes there is a pinkish or lilac suffusion on the penultimate and ultimate rows. The head is uniform olivaceous above, merging to yellow on the lips, and usually has no streaks from the orbit, nor on the labials.

A very distinct variety occurs in South India which bears a narrow reddish line down the back on the confines of the 5th and 6th rows above the ventrals where the scales are 19, and the 4th and 5th where 17. This line disappears at the vent and I have noted is more vivid in males than females. I have never seen this in specimens from the Ganges Basin (Fyzabad).

Disposition.—Though Cantor‡ remarks that the species is very fierce, and Ferguson§ quotes Ingleby's words to the same effect, I have invariably found it very much the reverse, in fact I know of no Indian snake with a more inoffensive nature and nicer manners. I am not courageous where snakes are concerned, and object strongly to being bitten even by species that I know to be harmless, so I am always chary of handling them, but this species like the buff-striped Keelback (*Tropidonotus stolatus*) is so remarkably gentle that I pick it up fearlessly and have never been struck at, or bitten. When alarmed the snake will erect itself and flatten the neck like all other Keelbacks, and it may have been this behaviour that led the writers named above to suppose it fierce. Even the two I had conjoined in Bangalore permitted my handling them and making close investigations, without resenting my interference further than to try and elude my grasp. This placid nature is by no means associated with a lack of spirit, for the little reptile is as vivacious, active in movement and alert as any snake I know.

---

* Cat. 1893 Vol. 1, p. 274.

† Rept. Brit. Ind. 1864, p. 273.

‡ P. Z. S. 1839, p. 54.

§ Bomb. N. H. Jourl., Vol. X, p. 73.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Haunts.—The olivaceous Keelback exhibits a strong taste for an aquatic environment, and the position and character of its nostrils conforming to the type seen in the true fresh water snakes (*Homalopsinæ*) in itself proclaims the snake a water snake by habit. In Fyzabad I got no specimen during 19 months' residence, but when the river overflowed its banks and flooded the country for miles in August 1906, I had 8 specimens brought to me in 14 days, all from the inundated area. It by no means haunts rivers to the exclusion of jheels and similar collections of water, nor does it show a greater liking for flowing water, for in Bangalore where it was very common it was found haunting the small collections of water in the Lal Bagh, and other similar pools, elsewhere. The snakemen there denied that it was a watersnake, and said they never found it actually in the water, but at the edge of the pools where the dank soil favoured a luxuriant growth. They also frequently encountered it in the foliage, and lying along the stems of the bamboo brash near the water. In the rains I think it leaves the vicinity of pools, and wanders further afield, there being abundant moisture in the grass and weeds that spring up everywhere. I have met with it in the grass at some distance from water during the monsoon, and remember capturing one which crossed the pitch at Berhampur while a cricket match was in progress on the parade ground. Ferguson remarks that one he had in captivity in Trivandrum was never seen to enter the chatty of water provided for it and Mr. Ingleby mentions that a caged specimen he had invariably buried itself in the sand at the bottom of its cage with nothing but the extremity of its head and its eyes sticking out.

Habits.—*Schistosus* evinces a markedly diurnal habit being frequently encountered in daylight in the haunts it favours. It is probable that with such pronounced aquatic tastes, it is forced to retire for many months in the year. All the specimens I can recall were about during the rainy season of the year.

I have already alluded to the attitude it adopts when alarmed, a posture very typical of the Keelbacks of many genera including *Tropidonotus*, *Pseudoxenodon* and *Macropisthodon*. The neck in this species is very markedly flattened cobra-wise, and in addition

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the snake flattens the part of the body not erected against the ground. I think this is noticeable to a more marked degree in the ♀. By no means every specimen one meets displays this attitude of alarm, for while some erect themselves as soon as disturbed, others require a good deal of provocation before they are worked up to the necessary degree of excitement. Usually when disturbed it slips away to the nearest cover, moving actively and speedily, and when captured is a very restless little creature striving time after time to reach the nearest available cover.

It is evidently an adept climber, to successfully negotiate the smooth stems of bamboo that arise at first perpendicularly from the ground. The Bangalore snakemen told me that they frequently found it as high as 8 and 10 feet from the ground, and it was in such a situation that the conjoined pair brought to me were reported to have been found.

Food.—Specimens I had in captivity fed on frogs, and Mr. Ingleby found the frogs that he offered were taken. Günther* includes fishes in its dietary. I cannot recall ever having got a specimen that had recently fed in a state of liberty.

The sexes.—As far as I can judge from my notes the sexes in Fyzabad and Bangalore are evenly balanced. Females as already stated attain considerably greater length than males, but males have relatively much longer tails, and therefore more numerous subcaudal shields. The males of the S. Indian variety appear to have a brighter red dorsal line and females appear to be able to flatten themselves more noticeably. The ♂ clasper is beset with numerous small falciform processes from the base to the tip.

Breeding.—Our knowledge of this is somewhat fragmentary, and leaves a good deal yet to be elucidated. The mating season appears to be during the rains from the single dated observation available, which came under my own notice. None of the 4 adult females I had in Fyzabad were gravid which points to the deposition of eggs being already accomplished before August, unless mating had up till then not been in progress. The latter possi

* Loc. cit.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bility is suggested by the pair found "in copula" in Bangalore, and brought to me on the 27th of August. These were observed united reclining on a bamboo stem 8 or 10 feet above the ground. On the evening of the 26th an attempt was made to capture them, but not pressed as the snakemen feared they would not earn their reward of Rs. 5 if they separated. They were successfully captured next morning and brought to me still united, and I had them under observation for some time. As far as I know they did not disengage for at least 25½ hours. During this time I repeatedly examined them, and found the left clasper of the male engaged with the right orifice of the female. The ventral apposition of the two was so limited that nobody seeing them together would have suspected that they were coupled. They each lay in sinuous courses without their bodies or their tails being enwreathed and there was nothing demonstrative in their attachment as far as I could see at any time. Unfortunately the union was unfruitful, due, I believe, to my moving north to the United Provinces immediately after. The cold weather so far depressed the natural vigour of a *Macropisthodon plumbicolor* I also took from Bangalore with me, that a frog it swallowed remained undigested for some weeks and was subsequently disgorged and when the snake died 5 months and 6 days subsequently to its capture it was found to be gravid with the impregnated follicles but little enlarged, and much in the same state as the impregnated follicles of the *schistosus* at death. The period of gestation is not known.

Eggs.—The species is known to be oviparous from a cluster of eggs which Tennent* refers to which was found near a river in Ceylon, and from which 20 young snakes subsequently emerged. Unfortunately he does not give the date of their birthday. I had a gravid specimen sent me from Ceylon containing 10 eggs nearly one inch long but the date of capture was not recorded. My impregnated ♀ referred to above had 18 follicles enlarged. From these events it appears that *schistosus* is moderately productive.

Young.—The smallest specimens I have had both from Ceylon, measured 6⅝ and 6⅞ inches, and from their appearance I believe

* Nat. Hist. of Ceylon, p. 308.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

were hatchlings. Here again no dates were given as to date of capture.

Distribution.—It is probably a commoner snake than available records which are rather meagre would make it appear. Before I went to the United Provinces it was not known to occur any where near there, but was evidently not uncommon. I got several specimens when stationed in Orissa (Berhampore). It is one of the commonest snakes about Bangalore, and is evidently common in Ceylon as I had 3 specimens in a small collection sent me from Henaratgoda.

It appears to be chiefly, if not entirely, a snake of the plains but is plentiful at 3,000 feet in Mysore, and has been recorded from the Anamallays and the Wynaad without any definite altitude being specified.

I have examined the three specimens collected by Anderson* in Yunnan which he referred to as a variety, *viz.*, *Yunnanensis*, but as all these specimens have the internasal shield divided, and a single internasal shield is one of the generic characters, and constant in all the other species it seems to me that these should be referred to a species apart from *schistosus* and unless the generic characters are modified should not even rank as a *Helicops*. Besides this feature in lepidosis, there is another, *viz.*, that the nasal shields in Anderson's specimens touch the 1st and 2nd supralabials, whereas in Indian specimens it almost always touches the 1st only.

The Malay Peninsula which has been included within its area of distribution on Cantor's authority I discredit, having already shown good cause to doubt many of Cantor's records.† No less than six Indian species have been recorded by this authority alone, from the Malay Peninsula, and as he received snakes from India the inference is that Indian specimens got mixed with his own Malay collection.

The accompanying map shows the area of distribution based on present records, but it seems likely to be extended as our knowledge progresses.

---

* Ann. Zool. Res. Yunnan 1879, p. 822.

† Bomb. N. H. Jourl., Vol. XVIII, p. 720.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Lepidosis—Rostral.—Touches 5 shields, the nasal sutures largest. *Internasal*—Single. *Præfrontals*—Two, the suture between them subequal to the præfronto-frontal; in contact with internasal, nasal, loreal, præocular and supraoculars. *Frontal*—Touches 6 shields, the supraocular sutures longest. *Supraoculars*—Length and breadth rather less than frontal. *Nasal*—Semi-divided, touching the 1st only of the supralabial series usually, the 2nd also sometimes. *Loreal*—Single, about as long as high. *Præoculars*—One. *Postoculars*—Three. *Temporals*—Two, elongate, the lower touching the 6th, 7th and 8th supralabials. *Supralabials*—8, with the 3rd and 4th touching the eye, or 9 with 4th and 5th touching the eye. *Infralabials*—7, the 5th, 6th and 7th normally touching the posterior sublinguals, 7th largest and touching 3 scales behind. *Sublinguals*—Two pairs, the posterior rather the larger. *Costals*—Two headslengths behind head 19, midbody 19, two headslengths before vent 17. Where the rows reduce from 19 to 17 the 4th row above the ventrals is absorbed into the one above or below. (This step usually well behind midbody sometimes occurs at midbody or even slightly before this); keels distinct except in the last two rows in midbody where they are absent; apical pits wanting. *Ventrals*—139 to 149 in Bangalore specimens, 145 to 157 in Fyzabad (Boulenger 129 to 151). *Anal*—Divided. *Subcaudals*—Divided, 63 to 82 (Boulenger 55 to 85).

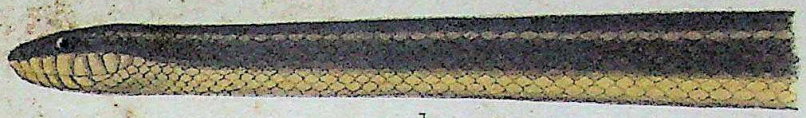
Anomalies.—I have twice seen the internasal partially divided posteriorly in Indian specimens. I have twice seen 3 præfrontals in a transverse series, the median rather the smallest. Once there were but 2 postoculars on one side. Once the last ventral was divided and once the 35th, 36th and 37th ventrals were divided. In one example there were only 7 supralabials, the 3rd and 4th touching the eye.

Dentition—Maxillary*—19 to 21, gradually but progressively increasing in size posteriorly with no gap. *Palatine*—11, subequal, and about the same size as the median maxillary. *Pterygoid*—17 to 18, subequal, and about the same size as palatine. *Mandi-*

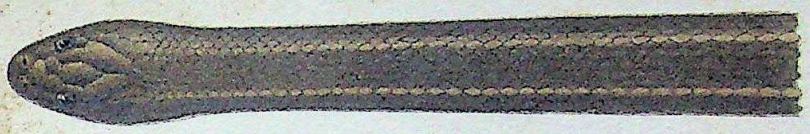
* From 2 Fyzabad skulls.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

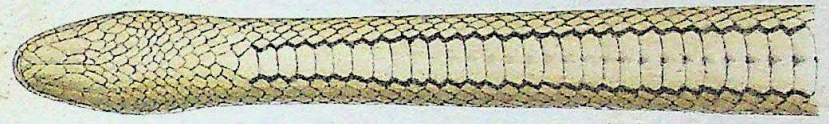
Digitized by Arya Samaj Foundation Chennai and eGangotri



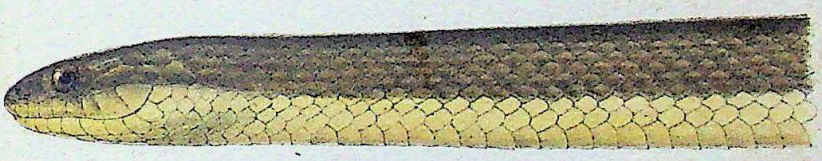
1.



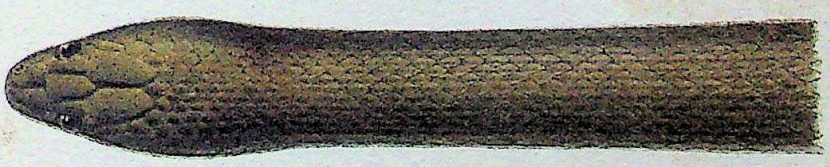
1a.



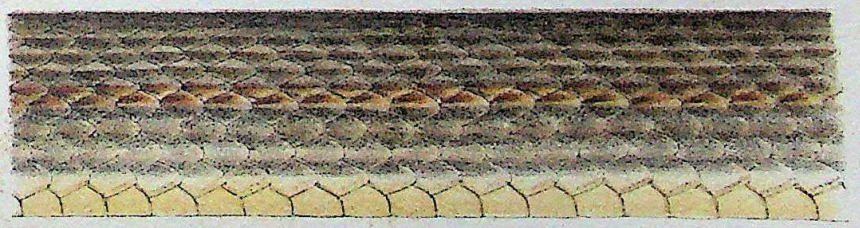
1b.



2.



2a.



2b

P. Gerhardt del. J. Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall).

1. Hypsirhina enhydris, *poisonous, nat. size.*

2. Helicops schistosus, *harmless nat. size.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bular—20 to 22; subequal, the first and last perhaps rather shortest.

Our plate leaves nothing to be desired, unless it is the dorsal colour which is usually of a greener tinge.

HYPSIRHINA ENHYDRIS (Schneider).

Schneider's Water Snake.

This snake being furnished with grooved teeth in the back of the maxilla comes into the opisthoglyphous "series" of colubrines. The series includes three subfamilies, *viz.*, *Homalopsinæ*, *Dipsadomorphiinæ* and *Elachistodontinæ*.

The homalopsids are true fresh water snakes and classified in ten genera, seven of which are represented in India. One of these, *viz.*, *Hypsirhina*, includes fifteen species, one of which *enhydris* forms the subject of this paper. The type of the genus is *H. plumbea* which inhabits the Malayo-Chinese area and has been found in Burma.

History.—Our first introduction to *H. enhydris* is through Russell*, who under the name "Mutta pam" figured and remarked upon a specimen in 1796 which had been captured in an Eel trap in the Lake of Ankapilly (North of the Godavery, near Vizagapatam). Three years later Schneider alluded to it in his History of Amphibians, under the name *Hydrus enhydris*.

Nomenclature—Scientific.—The generic name from the Greek "hypsi," high, and "rhis," the nose, was introduced by Wagler in 1830 on account of the high position of the nostrils on the snout. The specific name also from the Greek "En," in, and "hydor," water, was given in 1799 by Schneider in allusion to its aquatic mode of life.

English.—Schneider's Water Snake suggests itself, reserving Russell's name to designate the other common water snake first alluded to by him and to which Schneider also stands as godfather. I refer to *Cerberus rhynchops*.

Vernacular.—The names mentioned by Russell are the only ones known to me in India. These "Mutta pam," mud snake, and

* Ind. Serp., Vol. 1, pl. XXX.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"Ally pam" are presumably in use in the Vizagapatam District. In most places in India I expect it would come under that very comprehensive title "pani ka samp." Günther mentions "oular ayer" as the name by which it is known to the natives in Java, and Flower says—"In Siam it is called "Ngu-pla," or fish snake, in common with other homalopsids.

General characters.—The head is moderately depressed and the snout evenly rounded so as to present no canthus. The muzzle is rather long, and presents a moderately rounded anterior outline. The nostrils which are transverse slits, are placed on the top of the snout, and perforate the middle of the nasal shields, a suture running from them to the first supralabials. The eye is rather small, placed high on the face and set laterally with an inclination forwards and upwards. The iris is studded with golden specks, especially at the pupillary margin so that the vertically elliptic shape of the pupil is distinctly revealed. The commissure of the mouth turns up abruptly behind.

The body is smooth glossy and cylindrical, of moderate calibre for the length of the snake and dwindles to a neck anteriorly. Posteriorly the attenuation is more gradual. The tail is about one-fifth the total length.

Dimensions.—I have seen no specimens exceeding the measurement given by Boulenger which is 2 feet $2\frac{3}{4}$ inches (680 mm). My largest specimen was 2 inches less.

Colouration.—Dorsally the snake is a dark olivaceous green, or olivaceous brown, this colour ending abruptly on the 3rd costal row above the ventrals, and just above the supralabial on the side of the face. Usually there is a pale stripe down the body on the 8th row above the ventrals, but this may be obscure or even absent. The belly and the lowermost two and a half costal rows are pale lemon-yellow. The ventrals are demarcated laterally by a dark line and there is often too a median continuous, or interrupted dark line in the middle of the belly, but this may be entirely absent.

(*H. bilineata* and *H. furcata* (Gray). A specimen sent to me by Captain Frere from Mimbu, Burma, has a beautiful coral-pink stripe in the flanks, anteriorly on two rows (the penultimate and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

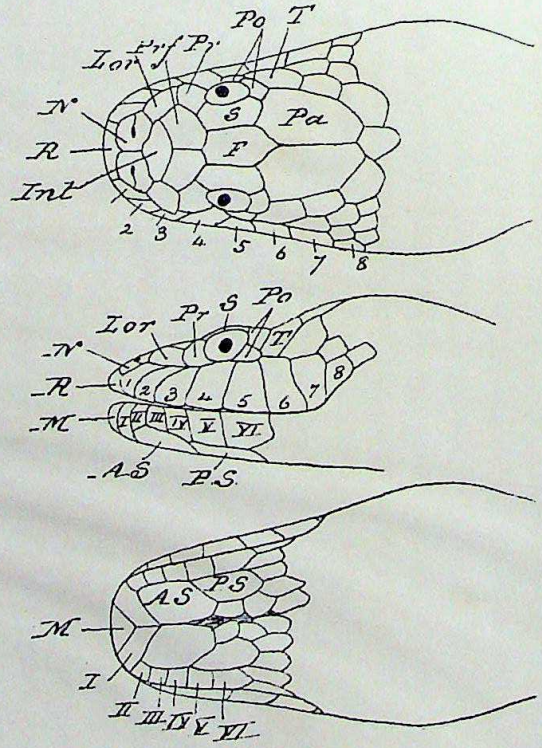
THE COMMON INDIAN SNAKES.

Hypsirhina enhydris.

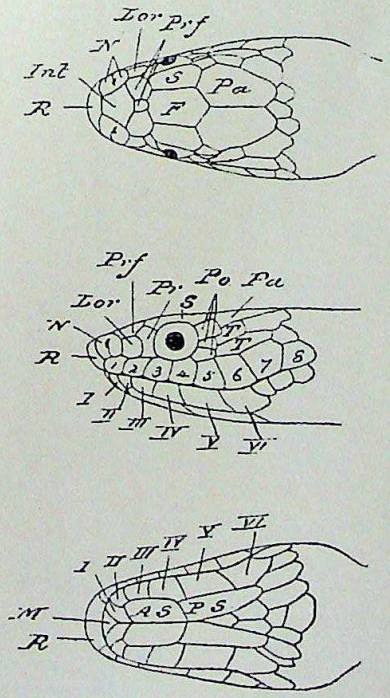
EXPLANATION OF DIAGRAM.

A. S.	Anterior Sublinguals.
F.	Frontal.
Int.	Internasais.
Lor.	Loreal.
M.	Mental.
N.	Nasal.
Pa.	Parietal.
Po.	Postocular.
Pr.	Præocular.
Prf.	Præfrontal.
P. S.	Posterior Sublingual.
R.	Rostral.
S.	Supraocular.
T.	Temporal.
1 to 8.	Supralabials.
I to VI.	Infralabials.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



Hypsirhina enhydris (×2).



Helicops schistosus ($\frac{1}{1}$).

COMMON SNAKES OF INDIA.

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ante-penultimate), later on the penultimate only. This stripe begins behind the neck and ends before the vent. The specimen otherwise is like Indian examples. Flower records a specimen from Kedah in the Malay Peninsula which appears to have had five ventral lines instead of the normal three.)

Identification.—This is very easy. First note that the nasal shields are in contact behind the rostral, then count the scale rows in midbody which will be found to be 21 to 23.

Disposition.—I cannot recall ever having seen a live specimen, but Dr. Cantor who appears to have been very familiar with it says it is a timid inoffensive snake.

Haunts.—Schneider's water snake is thoroughly aquatic in habit, as might be inferred from the character, and position of its nostrils. It frequents rivers, estuaries, lakes and marshy ground, even being found according to Cantor in irrigated fields.

Food.—Dr. Cantor states that it feeds on fishes under natural conditions, though these were not acceptable in captivity.

Breeding.—Captain (now Colonel) G. H. Evans came across a pair "in copula" at Hmawbi (Lower Burma) on the 16th October * 1899, which were unfortunately despatched instead of being kept for the fruits of their intercourse. The two snakes measured 1 foot 8½ inches and 1 foot 8¾ inches, and though the sexes were not at the time ascertained we may presume the former to have been the ♀ by the numbers of the ventral and subcaudal shields, which were 169 + 67. In the longer specimen these shields counted 161 + 72. Another ♀ was taken by Theobald † near Rangoon in a gravid condition in March. She measured 18 inches and contained 6 eggs. Although it is definitely known that the species is viviparous from Cantor's observations, the period of gestation is not known as it appears from his account that a ♂ shared the incarceration. Apparently congress was not witnessed but after six months' captivity the ♀ gave birth to 11 young. During parturition it was observed that the anterior part of the

---

* Not as originally reported November.

† Cat. Rept. Brit. Burma, p. 57.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

abdomen was retracted towards the spine. The mother died immediately after the event, and two of her brood within two hours. These were noted to have measured 6 and 6¼ inches. The young sloughed immediately after birth, even the two that succumbed so soon having accomplished this function. The remainder of the family wreathed themselves round the ♂, lifting their heads at intervals to the surface to breathe. All died within two months. The season when the event took place is not noted.

Parasites.—A specimen sent to me from Champaran (Behar) had numerous nematodes in the stomach, probably the same worm that is so frequently seen in the stomach of the chequered keel-back (*Tropidonotus piscator*) and other snakes. I took it to be this worm, *viz.*, *Kallicephalus willeyi*. As a result of this parasitic invasion the organ was much thickened, and its walls rigid and distorted.

Distribution.—North-East India, Assam, Burma, and the South of the Asian Continent through Indo-China to China. Tenasserim, Malay Peninsula to the Archipelago as far East as Celebes.

Though Ceylon is mentioned by Flower and Boulenger (Cat. 1896) I can find no authority for this. It was not mentioned in Haly's list of Ceylon snakes in 1891, nor in Willey's list published as recently as 1906 (Spol. Zeylan. April 1906, p. 233). Further though Jerdon says it occurs in Southern India I can find no record of it south of the Godavery River. There is a specimen in the British Museum presented by Jerdon, and reported as from Darjeeling. This in all probability means Darjeeling District, and probably came from the base of the Himalayas. I have had a specimen from Jalpaiguri in the same neighbourhood. Though known from Burma and Tenasserim it has not as yet been reported from the Andamans or Nicobars.

The precise localities known to me are shown in the accompanying map.

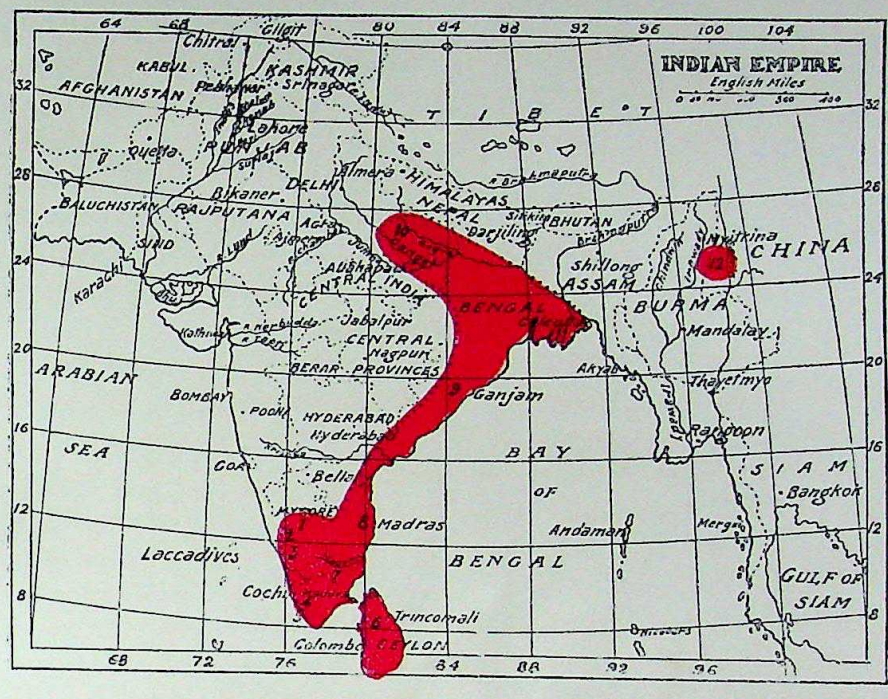
It may be a commoner snake in India than available records make it appear. In Assam too the same remark may apply. In Burma Theobald says it is common in the Pegu District, and Evans and I collected 9 specimens in 15 months, in the Lower part of that Province.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

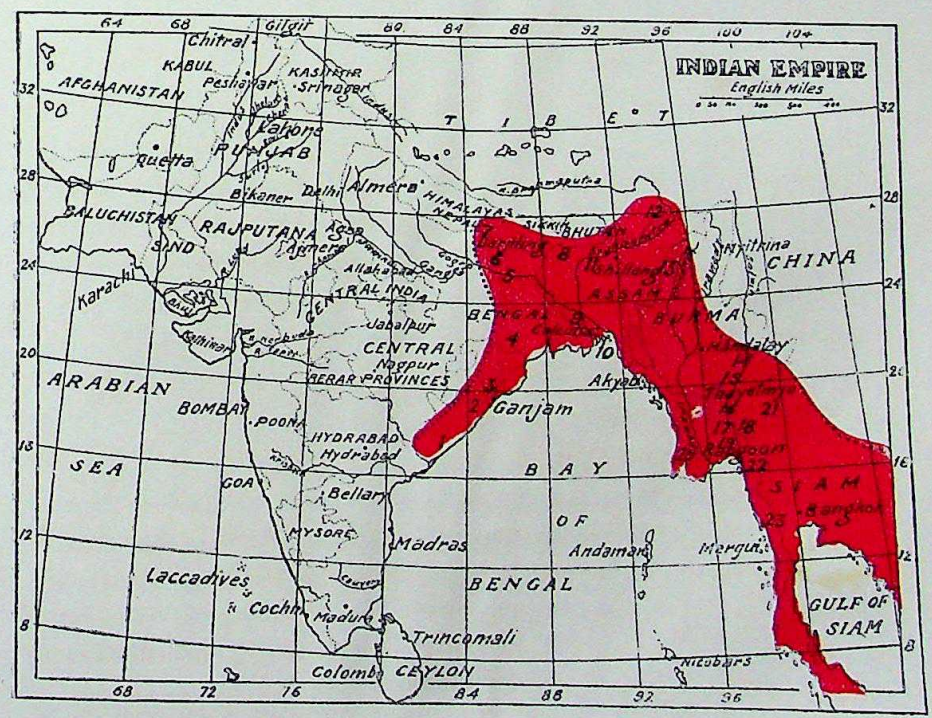
Digitized by Arya Samaj Foundation Chennai and eGangotri

Distribution of *Ichnemia chlorosoma*

.....Implies limits uncertain.



Distribution of *Hypsirhina enhydris*.



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Lepidosis—Rostral.—Touches 4 shields. *Nasals*—In contact behind the rostral; semi-divided; in contact with only the 1st of the supralabial series. *Internasal.*—Single, broader than long. *Praefrontals*—A pair; in contact with internasal, loreal, præocular and supraocular. *Frontal*—Touches 6 shields, the fronto-supraocular sutures longest. *Supraocular.*—Breadth and length rather less than frontal. *Loreal*—One. *Praeocular*—One. *Postoculars*—Two. *Temporal*—One. *Supralabials*—8 normally, the 4th only touching the eye. *Infralabials*—6; the 6th longest, the 3rd, 4th, 5th and 6th, or the three latter only touching the posterior sublinguals. *Sublinguals*—Two pairs; the anterior larger. The posterior quite separated by scales. *Costals*—Two headslengths behind head usually 23 (rarely 25), midbody usually 21 (rarely 23), two headslengths before vent 21; smooth. *Ventrals*—150 to 177, rather narrow so that 3 or 4 rows of costals can be seen on each side when the snake is laid on its back. *Anal*—Divided. *Subcaudals*—47 to 78, divided.

Anomalies—I have seen two præoculars once, and two temporals once. The last two ventrals were divided in one specimen, and the last only in another. In another example the 38th to 54th subcaudals were entire.

Dentition.—Maxillary teeth 17, subequal; followed after a short gap that would take one tooth, by a pair of enlarged, obliquely set teeth deeply grooved on their anterior faces. *Palatine*—10 to 11 subequal, as well developed as the maxillary. *Pterygoid*—18 to 24, as well developed anteriorly as the maxillary; decreasing in size posteriorly. *Mandibular.*—23 to 24, subequal as long as the maxillary.

Our plate is excellent in every particular.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

By

Colonel C. J. Bamber, F.L.S.,

Indian Medical Service.

Part X.

(*Continued from page 228 of this Volume.*)

Herbs, erect, with Alternate Stipulate Lobed Leaves.

Petals United.

Lavatera kashmiriana, Malvaceæ. F. B. I. i. 319. Kashmir. Hazara, 7-8,000 ft.

stems covered with down, branching; leaves lower, 5-lobed, circular, heart-shaped at the base, round-toothed, smooth above, downy beneath, stalk as long as the blade, upper 3-5 lobed, lobes short-pointed, central longest, stipules linear-lanceolate; flowers 3 in. diam., pink, on axillary stalks, bracteoles 3, united below, broadly ovate, shortly pointed, sepals 5, lanceolate, longer than the bracteoles, petals 5, united below, wedge-shaped, deeply bifid, stamens united into a column, woolly, styles many; carpels many, separating from the axis, kidney-shaped, smooth, shorter than the axis seeds one in each carpel.

Malva verticillata, Malvaceæ. F. B. I. i. 320. The Plains to 12,000 ft. Simla, Matiana (Collett).

large, branched, downy, annual or perennial; leaves 2-6 in. diam., nearly round, 5-6 shallow lobes, downy, stalks 6-7 in., stipules lanceolate, hairy; flowers small, pale pink crowded in nearly sessile axillary clusters, bracteoles 3, ununited, linear, sepals 5, united below, triangular lanceolate, petal 5, united below, twice the length of the sepals, margin notched, stamens united into a tube, styles

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

10-12; carpels 10-12, enclosed in the enlarged calyx, netted on the sides, ribbed at the back, each carpel one-seeded. This plant is sometimes used as a potherb.

Malva sylvestris,
Large mallow,
MALVACEÆ.
F. B. I. i. 320.
The Plains to 8,000 ft.
Theog (Collett).
Kashmir.
Hazara.

medium-size, annual, smooth or with a few hairs; leaves 1-3 in. diam., 5-7 blunt, shallow lobes, rounded, base heart-shaped, stalks 1-3 in., stipules oval, short-pointed; flowers 1-1½ in. diam., pink streaked with purple, on axillary stalks, 1 in. long, bracteoles ovate, shorter than the bell-shaped calyx, petals with bearded stalked bases, carpels downy or not, netted; otherwise like the last species.

Abutiion graveolens,

see Herbs, Erect, Alternate, Stipulate, Simple.

Urena repanda,
MALVACEÆ.
F. B. I. i. 330.
The Plains to 1,000 ft.
East of the Sutlej.

medium-size, perennial, much branched, covered with star-shaped hairs; leaves, lower 2-2½ in. long, roundish, somewhat lobed, heart-shaped base, slightly toothed with rounded notches, upper lanceolate, stipules linear; flowers ⅔ in. pink in racemes, ultimately in leafless clusters, bracteoles 5, ¼-⅓ in., awl-shaped, united below into a strongly ribbed cup, nearly leathery, larger than the calyx, sepals 5, united half way up, stamens united into a tube, styles 10; carpels 5, smooth, separating from the axis when ripe, each carpel one-seeded, seeds smooth.

Hibiscus Trionum,
MALVACEÆ.
F. B. I. i. 334.
The Plains to 6,000 ft.
Kashmir.
Hazara.
Sutlej Valley (Collett).
Baluchistan (Lace).

medium-size, annual, more or less coverd with star-shaped hairs; leaves 1-1½ in., divided to the base (lower leaves sometimes circular, undivided), lobes usually 3, lobed and toothed, stalks 1-1½ in. long, stipules awl-shaped, covered with long stiff hairs; flowers 1½ in. diam., pale yellow with a dark-purple centre, calyx 5-lobed to the middle, bell-shaped, inflated, lobes broad, short pointed, nerves

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

hairy winding, afterwards purple, petals 5, united below and with the staminal tube, stamens united into a tube, styles 5, united half way up; capsule oblong, blunt, 5-celled, velvety, splitting from above into 5 valves, seeds many, kidney-shaped, velvety with star-shaped hairs.

Hibiscus surattensis, see Prostrate Herbs, Alternate, Stipulate, Lobed.

Hibiscus Solandra,
MALVACEÆ.
F. B. I. i. 336.
The Plains to 5,000 ft.
Simla.
Sutlej Valley (Collett).

medium-size, annual, velvety or hairy, slightly branched; leaves 1-2½ in. across, heart-shaped at the base, short-pointed, coarsely toothed, hairy on both sides, lower leaves long-stalked, ovate or circular, more or less 3-lobed, upper deeply 3-lobed, lobes narrowly oblong, stipules bristly; flowers ½-¾ in. diam., yellow, white or pink on solitary jointed axillary stalks, 1½ in. long, in a loose leafless terminal raceme, sepals united below, triangular, short pointed, petals broad at the tip, notched; capsule ovoid, pointed, hairy at the top, not longer than the calyx, seeds blackish; otherwise like *Hibiscus Trionum*.

Hibiscus vitifolius,
Ban kapás.
MALVACEÆ.
F. B. I. i. 338.
The Plains to 2,000 ft.

large, annual or biennial, hairy, slightly prickly, branches many; leaves 1-4 in. diam., 3-7 lobed, lobes short-or long-pointed, smooth or felted on both surfaces, toothed, stalks 2½ in., stipules very small, bristly; flowers 2½ in. diam., yellow with a purple centre, drooping on axillary, solitary or clustered at the end of branches, stalks jointed bracteoles 5-8, bristly, linear,not united and shorter than the calyx, sepals united half way up, lanceolate, velvety, petals two or three times as long as the sepals, capsule hairy, beaked, 5-winged, shorter than the sepals, seeds brown, tubercled; otherwise like the last species. The bark yields a strong silvery fibre.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

Hibiscus Gibsoni,
MALVACEÆ.
F. B. I. i. 339.
The Plains.

medim-size, perennial, branches bristly or prickly; leaves 1-3 in., deeply divided into lobes, lobes oblong-lanceolate, toothed, smooth or hairy, stalk as long as the blade; flowers twice the length of the bracteoles, yellow with a purple centre or all purple, on solitary axillary stalks, bracteoles ununited, linear, prickly, curving over the calyx, sepals united below, lanceolate, staminal tube half covered with anthers, capsule ovoid, pointed, valves bristly, seeds soft with scattered hairs; in other points like the last species.

Hibiscus Sabdariffa,
Rozelle or Red sorrel,
Patwa.
MALVACEÆ.
F. B. I. i. 340.
The Plains cultivated.

large, annual, smooth, stem purplish; leaves 2-3 in., wedge-shaped at the base, usually 3-5 lobed, lower leaves are sometimes not lobed, lobes lanceolate or oblong, glandular beneath, toothed, stalk 2 in., reddish, stipules ½ in. long, linear, short pointed; flowers 2½ in. diam., yellow or purple on solitary axillary short stalks, thickened at the top, bracteoles 8-12, united to the base of the calyx, calyx enlarging in fruit, sepals united below the middle into a fleshy purple cap, bristly, capsule ovoid, pointed, hairy, shorter than the calyx, seeds nearly glabrous, kidney-shaped; otherwise like the last species. This plant is cultivated for the sake of the edible calyx, from which an acid jelly is prepared; it is used as a preventive of scurvy. The stems supply a strong silky fibre.

Hibiscus ficulneus,
MALVACEÆ.
F. B. I. i. 340.
The Plains.

very large, annual, branches usually covered with broad-based sharp prickles; leaves 2½-4 in., 5-7-lobed, with wide sinuses between the lobes, lobes broad at the tip, narrow at the base, unequally toothed stalks 2½-4 in., stipules ¼ in. long, linear, hairy, soon falling off; flowers 1-2 in. diam., white with a pink centre, on stalks, ½ the length of the leaf stalks, the upper in a leafless raceme, bracteoles 4-6, broad, leafy, sepals united nearly entirely, tips

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

thread-like, capsule 1½ in. long, ovoid, felted, with a curved beak, 5-angled, sticky when young, seeds round, softly hairy ; otherwise like the last species.

Hibiscus pungens
MALVACEÆ.
F. B. I. i. 341.
Himalaya, 2-5,000 ft. (Duthie).

medium-size, annual or perennial, branches bristly and dotted; leaves 5-8 in., heart-shaped, 7-lobed, lobes linear-lanceolate, long pointed, deeply toothed, upper 3-lobed, stalk longer than the blade, stipules broadly lanceolate, upper ones linear; flowers 5 in. diam., yellow with a purple centre drooping on racemose stalks 1-2 in. long, bracteoles 1 in., enlarging in fruit, calyx 5-toothed, staminal column with anthers all the way up, capsule ¾ in. long, slender, hairy; otherwise like the last species.

Hibiscus Abelmoschus, Musk mallow,
Mushk dana, Kasturi bhendi.
MALVACEÆ.
F. B. I. i. 342.
The Plains.

large, annual, hairy, branched; leaves heart-shaped, ovate or usually 3-7-lobed, lobes oblong-lanceolate, short-or long-pointed, coarsely toothed, hairy above or below, stalk longer than the blade, stipules small, awl-shaped; flowers 3-4 in. diam., yellow with a crimson centre, solitary, often apparently terminal on stout curved stalks, bracteoles 6-12, linear, ununited, hairy, much shorter than the calyx, sepals united except the 5 tips, split down on one side, capsule 2½-3 in., ovate, short-pointed, hairy, seeds kidney-shaped, with a musky scent; otherwise like the last species. Musk is obtained from this plant and it also yields a strong fibre, it is cultivated for these reasons.

Hibiscus canceilatus,
MALVACEÆ.
F. B. I. i. 342.
The Plains to 6,000 ft.
Simla, Syri (Collett).
Hazara (Douie).

large, annual, bristly, root spindle-shaped ; leaves 4-6 in., bluntly five-angled, or rounded, round toothed, hairy, upper leaves with angular lobes at the base, stalks 4 in., stipules linear; flowers 4-5 in. diam., drooping, yellow with a purple centre on stalks much shorter than the leaf-stalks, racemed at the ends of branches, bracts 2 at the base of each stalk, awl-shaped, bracteoles 10-18, 1½ in. long, linear, bristly, incurved, capsule ovoid, furrowed, very hairy, equal in length to the bracteoles.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

seeds many, kidney-shaped, black, not musky; otherwise like the last species.

Hibiscus esculentus, *Ckra.* *Bhindi, ramturai.* MALVACEÆ. F. B. I. i. 343. The Plains to 4,000 ft. cultivated.

large, annual, roughly hairy; leaves 8-12 in. long. 3-5-lobed, heart-shaped at the base, lobes lanceolate-oblong, coarsely toothed, rough, stalk as long as the blade, reddish, stipules linear; flowers large, yellow with a crimson centre on stout short stalks, shorter than the leaf-stalks, bracteoles 8-10, linear, equal in length to the calyx, soon falling off, capsule 6-10 in. long, oblong, tapering, 6-8 ribbed, smooth or hairy seeds many, round, with lines, smooth or hairy, otherwise like the last species. This plant is commonly cultivated as an unripe capsule and seeds are eaten as a vegetable. It yields a silky fibre which is used in paper making.

Pentapetes phœnicea, *Dopahariya.* STERCULIACEÆ. F. B. I. i. 371. The Plains in wet places.

large, annual, smooth or bearing a few scattered star-shaped hairs, branched; leaves 3-5 in., triangular or lanceolate with two lobes at the base, round-toothed, smooth above, star-shaped hairs on the veins beneath, stalk 1 in., stipules linear, equal in length to the stalk; flowers 1-1½ in., scarlet, open at noon, drop next morning, one or two together on jointed axillary stalks, bracteoles 3-5, thread-like, half the length of the calyx, soon falling off, sepals 5, lanceolate, united below, rough, petals 5, ovate with a broad tip, stamens 20, 15 fertile in 5 groups of three, alternating with 5 unfertile (staminodes) style dividing above and twisted, stigmas 5, minute; capsule ½ in. diam., nearly round, bristly with star-shaped hairs, shorter than the persistent sepals, seeds 8-12, in two rows in each of the 5 cells, angular rough.

FLOWERS, MINUTE, IN HEADS.

FLOWERS, ALL TUBULAR.

Artemisia Dracunculus, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia parviflora, see Herbs, Erect, Alternate, Exstipulate, Lobed.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS, ALL TUBULAR.

Artemisia scoparia, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia annua, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia maritima, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia vulgaris, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia Roxburghiana, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia vestita, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia laciniata, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia Moorcroftiana, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia Absinthium, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia Sieversiana, see Herbs, Erect, Alternate, Exstipulate, Lobed.

PETALS NONE.

Rumex hastatus,
POLYGONACEÆ.
F. B. I. v. 60.
Himalaya, 1-8,000 ft.
Kashmir.
Simla (Collett).
Hazara (Barrett).

medium-size, perennial root, stems and branches grooved, smooth; leaves 1-2½ by ¾-2 in., stalked, 3-lobed, two lobes projecting backwards, narrow, or not lobed, broadly triangular, long pointed, stipules tubular, thin, not fringed, soon torn and disappearing; flowers green, small, males and females, often turning red, in circular distant clusters forming axillary racemes and terminal branching racemes, often crowded in fruit, calyx 6-lobed, in fruit circular, pink, not fringed, notched at both ends, petals none, stamens 6, styles 3, stigmas fringed; nut sharply 3-angled, brown, enclosed in the three inner segments of the calyx.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS NONE.

Rumex acetosa,
POLYGONACEÆ.
F. B. I. v. 60.
Himalaya, 8-12,000 ft.
Kashmir.

like the last species, but male and female flowers on separate plants, branches few, racemes leafless, outer sepals reflexed.

Cannabis sativa,
Indian Hemp,
Bhang.
URTICACEÆ.
F. B. I. v. 487.
The Plains to 9,000 ft.
Hazara (Barrett).
Simla (Collett).
Baluchistan (Hughes-Buller).

large, annual, stems gooved, felted, branches few, erect, slender, a common weed, also cultivated, leaves 4-8 in. diam., opposite, stalked, much divided, upper leaves 1-5 lobed, lower 5-11 lobed, linear-lanceolate, middle lobe longest, coarsely and sharply toothed, long pointed, wedge-shaped at the base, dark green above, downy below, stipules lateral, awl-shaped, bristly; flowers greenish yellow, small, male and female on separate plants, males clustered in short, axillary, drooping branched racemes, calyx of 5 segments, segments boat-shaped, petals none, stamens 5, filaments long, thread-like, females crowded, sessile in the axils of leafy bracts, style arms 2, thread-like; achenes 1-12 in., flattened, hard, enclosed in the persistent bracts. The intoxicating drugs, ganja and charas consist of the resin obtained from the stem, young leaves and flowers, bhang is merely the dried leaves and achenes. Hemp is obtained from the fibrous stems.

Girardinia heterophylla,
Ker.
URTICACEÆ.
F. B. I. v. 550.
Himalaya, 5-8,000 ft.
Hazara (Barrett).
Simla (Collett).

large, annual, root perennial, stem and branches furrowed, covered with very long stinging hairs like a nettle; leaves 4-12 in. long and broad, long-stalked, 3-nerved from the base, broadly ovate, upper leaves 3-5 lobed, heart-shaped at the base, sharply toothed, stipules large, united, leaf-like, divided at the tip; flowers small, green, sessile, closely crowded, male and female on the same or separate plants, when male and female are together, the male are in nearly cylindric clusters on the lower part of the spike, and the female in clustered heads in the upper part, when separate, male in long slender, often branched spikes, and female in short oblong spikes, in fruit becoming thick and densely bristly; male flowers,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULTE LOBED LEAVES.

PETALS NONE.

calyx of 4 sepals, petals none, stamens 4, female flowers calyx tubular with a small 3-toothed mouth, splitting in fruit, style long, thread-like, persistent, stigma minute; capsule (achene) broad, flattened, ovate, black.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

Thermopsis barbata, LEGUMINOSÆ. F. B. I. ii. 62. Himalaya, 8-12,000 ft. Kashmir. Patarnala (Collett).

small to medium-size, perennial, rootstock woody, stems tufted, branches many, densely shaggy; leaves of 3 sessile leaflets with leaf-like stipules at the base, each node appearing to have a tuft of simple leaves, leaflets smooth or hairy, lanceolate, 1-2 in., entire; flowers dark-purple, 1 in. long, clustered in short axillary racemes forming a terminal branched raceme, bracts shaggy, united at the base or free, calyx top-shaped, 5-toothed, teeth lanceolate, two upper more or less united, three lower twice the tube, petals 5, all long stalked, posterior (standard) largest, circular, sides turned back, 2 wing petals, ovate, outer part broader, 2 keel petals faintly joined, oblong-ovate, stamens 10, ununited, style thread-like, incurved; pot 1-2 by $\frac{1}{2}$-$\frac{5}{8}$ in., linear-oblong. short-pointed, seeds 2-6.

Argyrolobium roseum, LEGUMINOSÆ. F. B. I. ii. 64. The Plains to 6,000 ft. Rawalpindi. Kahuta (Douie). Baluchistan (Boissier).

small, perennial, thinly silky, branches slender, spreading or prostrate; leaves digitately compound, leaflets 3, $\frac{1}{3}$ in., ovate with a broad rounded tip, base wedge-shaped, sessile, leaf-stalk equal to or shorter than the leaves, stipules minute, linear, persistent, ununited; flowers $\frac{3}{8}$ in., pink or yellow tinged with pink in 1-4 flowered leaf-opposed stalked racemes, longer than the leaves, calyx $\frac{1}{4}$ in., 2-lipped, slit nearly to the base, 5 distinct teeth, 2 to the upper, 3 to the lower lip, smooth, lanceolate, petals 5, hardly longer than the calyx, standard oblong-circular, notched longer than the upper lip of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

the calyx, wings oblong, keel broadly oblong, blunt, shorter than the standard, stamens 10, all united, 5 longer with large anthers attached at the end, 5 shorter with smaller anthers attached in the middle, style long, thread-like, incurved; pod $\frac{3}{4}$ in. long, erect, straight, narrow, flattened, seeds 10-15.

Lotononis Leobordea, LEGUMINOSÆ. F. B. I. ii. 64. Peshawar (Stewart). Baluchistan (Hughes-Buller).

small, annual, finely silky, branches many, spreading; leaves digitately compound, leaflets 3, $\frac{1}{4}$-$\frac{1}{2}$ in. long, lanceolate, rather fleshy, tip blunt, broad, with a minutely fine point, leaf stalks as long as the leaves, stipules minute, lanceolate, soon falling off; flowers $\frac{1}{4}$ in., pale yellow or red, nearly sessile, 1-5, in the axils of most of the leaves, calyx $\frac{1}{6}$-$\frac{1}{5}$ in., silky teeth 5, lowest tooth deepest, petals 5, a little longer than the calyx, standard narrow, wings shorter, narrower, keel petals firmly united, longer, tip sharply incurved, stamens 10, united in a tube, slit along the top, anthers as in the last species; pod linear-oblong, scarcely longer than the calyx, seeds 4-8.

Crotalaria medicaginea, see Prostrate Herbs, Alternate, Stipulate, Compound.

Ononis hircina, see Shrubs, Erect, Alternate, Stipulate, Compound.

Trifolium pratense, see Prostrate Herbs, Alternate, Stipulate, Compound.

Trigonella Fœnum-grœcum, Fenugreek, *Methi.* LEGUMINOSÆ. F. B. I. ii. 87. The Plains to 5,000 ft. Kashmir. Hazara. Baluchistan (Lace).

medium-size, annual, cultivated, strongly scented, robust, nearly smooth; leaves pinnately compound, leaflets $\frac{3}{4}$-1 in. long, lanceolate-oblong, tip broad, toothed, lateral nearly sessile, terminal stalked nerves prominent running into the teeth, stipules lanceolate, entire, long pointed, united to the leaf-stalk; flowers small, pale yellow in short racemes at the end of axillary stalk, often bristle tipped, calyx $\frac{1}{4}$-$\frac{1}{3}$ in., bell-shaped, teeth 5, distinct, linear, petals 5, narrow, standard and wings nearly equal, keel

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

shorter, blunt, a little longer than the calyx, stamens 10, upper nearly or quite free, others united; pod 2-3 in. long, often curved, long-beaked, seeds 10-20. This plant is cultivated as a fodder crop and a pot herb, the seeds are used as a spice and as a medicine.

Trigonella polycerata, see Prostrate Herbs, Alternate, Stipulate, Compound.

Trigonella Emodi,
LEGUMINOSÆ.
F. B. I. ii. 88.
Himalaya, 4-11,000 ft.
Kashmir.
Marali.
Baluchistan (Hughes-Buller).

medium size, often robust, smooth, much branched; leaflets 3, $\frac{1}{3}$-$\frac{3}{4}$ in. long, ovate with a broad tip, deeply toothed; stipules linear bristly, deeply toothed; flowers 4-6 rarely 12, racemes on stalks 1-2 in. long, terminating in a distinct point, calyx $\frac{1}{8}$-$\frac{1}{6}$ in., smooth, teeth linear as long as the tube corolla twice or thrice as long as the calyx; pod $\frac{1}{2}$-$\frac{3}{4}$ by $\frac{1}{6}$-$\frac{1}{3}$ in., linear-oblong, smooth, straight, seeds 4-6; otherwise like the last described species.

Trigonella corniculata,
LEGUMINOSÆ.
F. B. I. ii. 88.
The Plains to 12,000 ft.
Kashmir.
Simla (Collett).

very like the last species, but the calyx teeth are shorter, the pod is recurved instead of straight.

Melilotus parviflora, or indica, Melilot,
Sinji, metha.
LEGUMINOSÆ.
The Plains to 3,000 ft.
Jœngi.
Mianwalli District.

medium size, annual, slender, leaves pinnately compound, leaflets $\frac{1}{4}$-$\frac{1}{2}$ in., ovate or oblong, only upper part toothed, base entire, lateral leaflets nearly sessile, terminal one stalked, nerves prolonged to the teeth, stipules linear, long-pointed, united to the leaf-stalk, apex notched; flowers $\frac{1}{12}$ in., yellow in long axillary recemes, 1 in. long, in fruit lengthened to 2 in., calyx $\frac{1}{24}$ in., teeth 5, triangular, petals 5, $\frac{1}{12}$ in. soon falling off; pod $\frac{1}{24}$-$\frac{1}{8}$ in., tipped by the style, one-seeded. This plant

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

is a common weed in cornfields, and is sometimes cultivated as a fodder crop.

Melilotus alba,
White Melilot,
LEGUMINOSÆ.
F. B. I. ii. 89.
The Plains to 13,000 ft.
Simla (Collett).
Mianwalli District.

very like the last species, but more robust and taller, the racemes, flowers and pod are larger, and the latter is often two-seeded. This plant is also used for fodder, and is fragrant when drying.

Medicago falcata,
Medick, non-such,
LEGUMINOSÆ.
F. B. I. ii. 90.
Himalaya, 5-10,000 ft.
Mashobra (Collett).
Kashmir.

medium size, perennial, nearly smooth, branches many; leaves pinnately compound, leaflets 3, $\frac{1}{2}$-1 in. long, narrowly oblong, upper part toothed, base entire, lateral leaflets sessile, terminal one stalked, nerves prolonged to the teeth, stipules narrowly lanceolate, long-pointed, united to the leaf- stalk: flowers $\frac{1}{8}$ in., yellow in axillary stalked racemes, calyx $\frac{1}{6}$ in., bell-shaped, teeth 5, bristlelike, nearly equal, as long as the tube, petals 5, standard petal not stalked, keel shorter than the wing petals, blunt, corolla twice as long as the calyx, stamens 10, upper one free, others united, style smooth, incurved; pod $\frac{1}{2}$-$\frac{3}{4}$ in. long, sickle-shaped, smooth, seed, 5-10.

Medicago sativa,
Lucerne,
Alfafa.
LEGUMINOSÆ.
F. B. I. ii. 90.
The Plains to 5,000 ft.
Baluchistan (Boissier).

very like the last species, of which it may be the cultivated variety, but is more erect, less branched; flowers purple or blue, and pods rough, twisted into a double spiral. This plant is widely cultivated as a fodder crop.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

Cyamopsis psoraolides, *Kulthi, guár.* LEGUMINOSÆ. F. B. I. ii. 92. The Plains. Rawalpindi (Aitchison). Baluchistan (Hughes-Buller). — medium size, annual, robust, covered with laterally attached grey hairs, stems 4-sided; leaves stalked, leaflets 3, 2-3 in. long, ovate, short-pointed, deeply toothed, stipules linear-bristle-like; flowers ¼ in., purplish, in shortly stalked 6-30 crowded axillary racemes, bracts bristle-like, projecting beyond the buds, calyx ⅙-⅓ in., tube oblique, teeth 5, unequal, lowest long, bristle-like, petals 5, just protruding from the calyx, soon falling off, standard and wing petals narrow, keel blunt, slightly incurved, stamens 10, united, style short, much incurved; pod 1½-2 in. long, straight, thick, fleshy, erect, 3-keeled on back, seeds 8-12.

Indigofera trifoliata, — see Prostrate Herbs, Alternate, Stipulate, Compound.

Indigofera trita, — see Shrubs, Erect, Alternate, Stipulate, Compound.

Taverniera nummularia, — see Shrubs, Erect, Alternate, Stipulate, Compound.

Ebenus stellata, — see Shrubs, Erect, Alternate, Stipulate, Compound.

Lespedeza juncea, — see Shrubs, Erect, Alternate, Stipulate, Compound.

Lespedeza Gerardiana, — see Shrubs, Erect, Alternate, Stipulate, Compound.

Lespedeza elegans, — see Shrubs, Erect, Alternate, Stipulate, Compound.

Lourea vespertilionis, — see Herbs, Erect, Alternate, Stipulate, Lobed.

Uraria picta. — see Herbs, Erect, Alternate, Stipulate, Compound, Leaflets many.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

Uraria lagopus, see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Uraria neglecta, see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Zornia biphylla.
LEGUMINOSÆ.
F. B. I. ii. 147.
The Plains to 5,000 ft.
Valleys below Simla (Collett).

small, annual, stems several, slender, branches wiry, zigzag, hairy or velvety, tufted; leaves stalked, leaflets 2, ½-1 in., lanceolate, leathery, dotted with black glands, stipules leaflike, lanceolate, produced down in a spur; flowers ¼ in. long, yellow, sessile in erect axiliary racemes, 1-3 in., each flower almost hidden in a pair of leaf-like fringed bracts, calyx minute, membranous, teeth 5, 2 upper united, 2 lateral very short, lowest equal to the upper, petals 5, standard round, keel sharply incurved, blunt, twice as long as the calyx, stamens 10, united into a tube, 5 longer with round anthers, alternating with 5 shorter with oblong anthers, style smooth, incurved; pod flattened, minutely prickly, protruding from the bracts, upper margin nearly straight, lower deeply indented, joints 2-5, seeds 2-5.

PETALS SIMILAR.

Rubus Clarkei. see Prostrate Herbs, Alternate, Stipulate, Compound.

Potentilla argyrophylla,
ROSACEÆ.
F. B. I. ii. 356.
Himalaya 8-13,000 ft.
Kashmir.
Matiana, Narkanda (Collett).

large, perennial, rootstock very stout, stem velvety, robust; leaves digitately compound, leaflets 3, 2-3 in., sessile or stalked, ovate, coarsely toothed green, and finely hairy above, white-felted beneath, main leaf stalk, 2-3 in., stem stipules united at the leaf stalk, ovate-oblong, short pointed; flowers ¾-1¼ in. diam., yellow or dark purple in terminal branched racemes, bracteoles 5, oblong, blunt, short or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS SIMILAR.

long pointed, calyx silky, persistent, lobes 5, alternating with the bracteoles, long-pointed, petals 5, heart-shaped with the notch outwards, stamens many, styles lateral, short, persistent; carpels very many, small, crowded on a small dry receptacle, fruit is a head of many hard smooth achenes, covered by the overlapping calyx lobes, achenes one-seeded.

LEAFLETS MANY.

PETALS DISSIMILAR.

Indigofera hirsuta, LEGUMINOSÆ. F. B. I. ii. 98. The Plains to 4,000 ft.

large, annual or biennial, densely hairy, with flat-lying hairs; leaves pinnate, 2-5 in., shortly stalked, leaflets 5-11, 1-2 in. long, opposite, ovate with a broad tip, membranous, grey-green, stipules bristle-like, feathered; flowers $\frac{1}{3}$ in., red in dense slender hairy axillary racemes 2-6 in., long, bracts minute, calyx $\frac{1}{8}$ in., densely velvety, teeth 5, bristle-like, long feathered, petals 5, not much longer than the calyx, soon falling off, standard ovate with a broad tip, keel petals united, straight, not beaked, spurred on each side near the base, stamens 10, upper free, the rest united, anthers tipped with a minute point, style smooth, incurved; pod $\frac{1}{2}$-$\frac{3}{4}$ in. long, cylindrical, densely velvety, 6-8 seeded.

Indigofera anabaptista, LEGUMINOSÆ. F. B. I. ii. 102. The Plains.

small, annual, branches spreading, covered thinly with hairs like those of the last species, but always white; leaves pinnate, shortly stalked, leaflets 3-7, opposite, $\frac{1}{2}$-1 in. long, lanceolate with a broad tip, stipules bristle-like, presistent; flowers $\frac{1}{6}$ in., scarcely longer than the calyx, in short dense, 12-20 flowered racemes, calyx $\frac{1}{8}$ in. silvery haired, teeth bristly, pod linear, reflexed; in other respects like the last species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Tephrosia purpurea, *Sarphanki.* LEGUMINOSÆ. F. B. I. ii. 112. The Plains to 6,000 ft. Simla (Collett). Baluchistan (Hughes-Buller.)

medium size, perennial, much branched, stems slender, cylindrical; leaves 3-6 in., pinnate, shortly stalked, stipules linear-awl-shaped, leaflets 13-21, narrow, lanceolate with a broad tip, blunt, green, smooth above, silky beneath; flowers $\frac{1}{4}$-$\frac{3}{8}$ in., red, thinly silky in leaf opposed loose-flowered racemes, 3-6 in. long, bracteoles minute, calyx $\frac{1}{8}$-$\frac{1}{6}$ in., silky, teeth 5, two upper teeth longer than the three lower, petals 5, $\frac{1}{4}$-$\frac{3}{8}$ in., standard circular, silky without keel, petals united, blunt, stamens 10, upper free, others united, style curved, smooth, tuft of hairs at the tip; pod $1\frac{1}{2}$-2 by $\frac{1}{3}$ in. sessile, velvety, flat, seeds 6-10.

Tephrosia villosa, LEGUMINOSÆ. F. B. I. ii. 113. The Plains.

small, perennial, stems zigzag, woody, finely downy with white flat-lying hairs; leaves 2-3 in. long, nearly sessile, stipules linear, ascending or reflexed, leaflets 13-19, grey green, nearly smooth above, silky below, narrow lanceolate with the tip broad and often notched; flowers $\frac{3}{8}$ in., red in racemes, six or more inches long, lower flowers in distant separate clusters of stalks, bracts bristle-like, feathered, calyx $\frac{1}{5}$-$\frac{1}{4}$ in., very silky, teeth 5, bristle-like, lower longer than the calyx tube, petals 5, not much longer than the calyx, stamens and style as in the last species, pod 1-$1\frac{1}{4}$ in. long., $\frac{1}{6}$-$\frac{1}{5}$ in. broad, densely velvety, curved, sharply bent down.

Tephrosia pauciflora, LEGUMINOSÆ. F. B. I. ii. 114. The Plains. Baluchistan (Lace.)

very like the last species, but leaflets 5-9, flowers stalked in pairs in the axils of leaves.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Sesbania aculeata, *Jayanti.* LEGUMINOSÆ. F. B. I. ii. 115. The Plains. Baluchistan (Lace.)

large, annual, shrub-like, branches and under surface of leaf midribs armed with small hooked prickles; leaves 6-12 in., leaflets more numerous and smaller than those of *Sesbania ægyptiaca*, see Shrubs, leaflets 41-81, smooth; flowers $\frac{3}{8}$-$\frac{1}{2}$ in., pale yellow dotted with red, in stalked loosely 3-6 flowered racemes, calyx 5-toothed, $\frac{1}{8}$ in., smooth, teeth short triangular, petals 5, stalked, standard petal broad, keel blunt, stamens 10, upper free, others united, style thread like, smooth, incurved, pod 6-9 in., linear, slightly curved, beaked, smooth; seeds many.

Astragalus Falconeri, LEGUMINOSÆ. F. B. I. ii. 120. Hazara (Winterbottom).

large, perennial, stems almost woody, zigzag, velvety, white when young; leaves 1-1$\frac{1}{2}$ in., midrib ending in a point or leaflet, stipules broad, leaf-like, leaflets 13-17, $\frac{1}{4}$-$\frac{1}{2}$ in. long, lanceolate oblong, with broad tips, blunt; flowers $\frac{1}{2}$ in., lilac, in long stalked few-flowered racemes, calyx $\frac{1}{6}$ in., pouched, nearly smooth, teeth 5, very short, petals 5, wing petals short-pointed equal to the keel petals, stamens 10, upper one free, others united, style ncurved, smooth, pod $\frac{1}{2}$-$\frac{5}{8}$ in., narrowed to both ends, stalk twice as long as the calyx, 4-6 seeded.

Astragalus trichocarpus, LEGUMINOSÆ. F. B. I. ii. 121. Eastern Punjab. Himalaya 5-8,000 ft. Simla (Collett). Dharmpur.

large, perennial, nearly smooth, branches straight, twiggy, much furrowed; leaves 2-4 in., nearly sessile, midrib ending in a point or leaflet, stipules minute, leaflets 31-41, $\frac{1}{8}$-$\frac{5}{8}$ in., nearly blunt, pale green, covered with minute silvery hairs; flowers $\frac{1}{3}$ in., lilac crowded in stalked racemes, 3-4 in. long, bracts linear, minute calyx $\frac{1}{12}$ in., bell-shaped, oblique, smooth, teeth 5, triangular, petals 5, standard petal round, wings lanceolate shorter than the keel petals, stamens 10, upper free, others united, pod $\frac{3}{4}$-1, stalked, oblong velvety, seeds 4-6.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Astragalus ciliolatus, LEGUMINOSÆ. F. B. I. ii. 129. Himalaya, 6-9,000 ft. Kashmir.

medium size, perennial, stems hollow, smooth; leaves 6-9 in., midrib ending in a point or leaflet: leaflets 17-19, $\frac{1}{2}$-$1\frac{1}{2}$ in., oblong, blunt, green, smooth, stipules $\frac{1}{4}$-$\frac{1}{2}$ in., lanceolate or triangular, free persistent; flowers $\frac{3}{4}$ in., yellow tinged with lilac, crowded nearly all on one side of long-stalked racemes, bracts linear, shorter than the buds, calyx $\frac{3}{8}$ in., tubular, oblique, teeth 5, bristle-like, feathered, petals 5, keel shorter than the standard and wing petals, broad, abruptly upcurved, stamens and style like those of the last species; pod 1 in., oblong, expanded, narrowed into a beak, covered with fine short spreading black hairs, stalk $\frac{3}{8}$ in., seeds 8-20.

Astragalus frigidus, LEGUMINOSÆ. F. B. I. ii. 130. Lahoul.

medium size, perennial, stout, smooth; leaves 4-6 in. long, stipules $\frac{1}{2}$-$\frac{3}{4}$ in. long, ovate or lanceolate, sharp-pointed or blunt, free, persistent, leaflets 9-15, oblong, one or more inches long, opposite, thin, smooth above, with a bluish waxy gloss and a few hairs below; flowers $\frac{3}{4}$ in., bright yellow arranged nearly all one side on long stalked racemes, calyx $\frac{3}{8}$ in., tubular, with a few flat-lying hairs, teeth 5, minute, petals 5, standard longer than the wings and keel petals, stamens and style as those of the last species; pod 1 in., expanded, smooth, oblong, stalked, narrowed to both ends, 6-8 seeded.

FLOWERS, IN HEADS, IN THE NEXT SEVEN SPECIES OF ASTRAGALUS, AND TWO OF OXYTROPIS.

Astragalus prolixus, LEGUMINOSÆ. F. B. I. ii. 121. The Plains. Lahore.

small, annual weed, clothed densely with horizontal-lying white hairs, very slender; leaves $\frac{1}{2}$-$1\frac{1}{2}$ in., distinctly stalked, stipules free, minute, lanceolate, leaflets 11-17, oblong, blunt, $\frac{1}{8}$-$\frac{1}{4}$ in., covered with the horizontal white hairs; flowers $\frac{1}{10}$ in. yellow 6-12 together in heads on stalks a little shorter than the leaves, calyx less than $\frac{1}{12}$ in., densely matted, teeth 5, linear-bristle-like, nearly equal to the calyx tube petals, stamens and style

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

as above; pod $\frac{1}{4}$-$\frac{3}{8}$ in., sessile expanded, densely velvety, straight, linear-oblong, 6-8 seeded.

Astragalus Aitchisoni,
LEGUMINOSÆ.
F. B. I. ii. 121.
Salt range (Aitchison).
Pindigheb.
Rawalpindi District (Douie).

small, annual weed, slender, thinly covered with white hairs; leaves $1\frac{1}{2}$-$2\frac{1}{2}$ in., distinctly stalked, stipules triangular, minute, leaflets 17-25, $\frac{1}{2}$ in., alternate, wide apart, grey green, a few short horizontal white hairs; flowers $\frac{1}{3}$ in., white with a purple tip, in a loose head of 4-6 flowers on a short stalk, bracts minute, calyx $\frac{1}{6}$ in., bell-shaped, thinly white silky, teeth 5, linear or lanceolate, petals 5, standard longer than the wings and keel, stamens and style as those in the last species; pod $1\frac{1}{2}$ in., slender, straight or slightly curved, slightly clothed with white hairs, 15-20-seeded, seeds very small.

Astragalus contortiplicatus,
LEGUMINOSÆ.
F. B. I. ii. 122.
The Plains.
Baluchistan (Boissier.)

small, annual weed, covered with short, soft, spreading white hairs; leaves 3-4 in., distinctly stalked, stipules small, free, lanceolate, leaflets 13-17 oblong-lanceolate with a broad and notched tip. $\frac{1}{4}$-$\frac{1}{2}$ in., wide apart, greenish, soft scattered hairs on both sides; flowers $\frac{1}{5}$ in., yellow in dense many-flowered heads on stalks, with few scattered soft hairs, much shorter than the leaves, calyx $\frac{1}{6}$ in., with a few scattered soft hairs, teeth 5, bristle-like, feathered, petals 5, projecting a little from the calyx, wings lanceolate, short-pointed, shorter than the standard and keel, stamens and style like those in the last species; pod $\frac{1}{2}$ in., cylindrical, much recurved, sausage-shaped, folded lengthwise, wrinkled, 20-30 seeded.

Astragalus melanostachys,
LEGUMINOSÆ.
F. B. I. ii. 125.
Himalaya, 10-15,000 ft.
Kashmir.
Lahoul.

medium size, perennial, fairly stout, smooth; leaves 1-3 in., distinctly stalked, stipules $\frac{1}{4}$-$\frac{3}{8}$ in., leafy, free, triangular with a sharp hard point, leaflets 13-15, oblong, green with a bluish waxy gloss, blunt or notched; flowers $\frac{1}{5}$-$\frac{1}{4}$ in., lilac or purple in crowded heads, 1-3 in. long, stalks 2-6 in., covered with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

short spreading black and also white hairs, dense just below the head, calyx $\frac{1}{6}$-$\frac{1}{5}$ in., covered with black silky hairs, teeth 5, equal to the tube, nearly sessile, petals 5, contracted, keel and wings shorter than the standard, stamens and style like those of the last species; pod $\frac{1}{5}$ in., oblong, sessile, black, silky, two-seeded.

Astragalus cashmirensis, LEGUMINOSÆ. F. B. I. ii. 127. Kashmir 9-10,000 ft. (Falconer).

small, perennial, stems stout, shaggy with long hairs; leaves 3-4 in., distinctly stalked, stipules $\frac{1}{2}$ in., lanceolate, thin, free, marked with lines, leaflets 29-33, oblong blunt, or short-pointed, $\frac{3}{8}$-$\frac{1}{2}$ in., crowded, dull, densely clothed at first with fine long hairs; flowers $\frac{3}{4}$ in., yellow in dense round heads on stalks 1-3 in., bracts $\frac{1}{4}$-$\frac{3}{8}$ in., linear, feathered, persistent, calyx $\frac{3}{8}$-$\frac{1}{2}$ in., thinly covered with long hairs, teeth 5, linear, petals 5, standard longer than the wings and keel, stamens and style like those of the last species; pod $\frac{1}{2}$ in., linear-oblong, straight, sessile, finely velvety, hollowed down the keel, narrowed into a long beak, 6-8 seeded.

Astragalus leucocephalus, LEGUMINOSÆ. F. B. I. ii. 128. Himalaya 1-7,000 ft. Simla, Naldera (Collett). Murree (Douie). Sakesar, Salt range.

small, perennial, densely covered with silvery white hairs, stems slender short; leaves 1-3 in., stipules small, leaflike, united below the middle, leaflets $\frac{1}{8}$-$\frac{1}{4}$ in., oblong, 21-31, thick, blunt or nearly short-pointed, close to each other, covered with silvery white hairs; flowers $\frac{1}{4}$ in., pale yellow in small very dense, oblong heads on densely white felted stalks, 2-6 in., bracts lanceolate, longer than the buds, calyx $\frac{1}{6}$ in., shaggy with white hairs, nearly sessile, teeth 5, bristle-like, equal to the calyx tube, petals 5, keel shorter than the standard and wings, stamens and style like those of the last species; pod $\frac{1}{6}$ in., oblong, sessile, finely downy, 3-4 seeded.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Astragalus Munroi.
LEGUMINOSÆ.
F. B. I. ii. 128.
Spiti, Lahul.

small, perennial, rootstock stout, long, woody, spindle-shaped, stems of a tuft of shoots from the base, stout, shaggy with dense spreading white hairs; leaves 1½-2 in., stipules ½ in., linear or lanceolate, free, leaflets 19-21, ¾-1 in., lanceolate with a broad blunt tip, thinly covered with loose white hairs; flowers ¾-⅞ in., yellow, in few-flowered sessile axillary heads, calyx ½-⅝ in., thinly velvety, teeth 5, linear, bristle-like, petals 5, nearly equal, stamens and style like those of the last species; pods oblong, sessile 1 in. long, inflated, 10-12 seeded.

Oxytropis lapponica.

see Herbs, Unbranched, Alternate, Stipulate, Compound.

Oxytropis cachemirica,
LEGUMINOSÆ.
F. B. I. ii. 139.
Kashmir 8-10,000 ft.

small, perennial, rootstock woody, stem short finely velvety; leaves 1-2 in., stipules lanceolate or triangular, united below, leaflets 13-21, oblong lanceolate, ⅜-½ in., densely white silky; flowers ½ in., yellow, rarely purple in dense heads, 12-30 flowered, on long stalks, bracts distinct, lanceolate, calyx ⅜ in., densely white silky, teeth 5, linear, nearly equal, petals 5, standard longest, keel shortest with a distinct point, stamens 10, one free, others united, style abruptly incurved, beardless; pod ⅜-⅝ in., sessile, much inflated, shaggy with loose dense white silky hairs, round-oblong, 5-6 seeded.

Oxytropis Meinshausenii,
LEGUMINOSÆ.
F. B. I. ii. 139.
Himalaya 9-11,000 ft.
Valley of Kishengunga.

small, perennial, stem distinct, at first thinly covered with soft scattered hairs; leaves 3-4 in., stipules ¼-½ in., free, lanceolate or oblong, leaflets 17-31, ½-¾ in., oblong, blunt, green, slightly covered with long whitish hairs on both surfaces, flowers ¾ in., yellow, rarely purple in a dense 12-20 flowered head on erect stalks, 4-6 in., bracts ⅛-¼ in., linear, covered with scattered black

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

hairs, calyx $\frac{3}{8}$ in., tubular, thinly covered with horizontal black hairs, teeth 5, linear, feathered in black, petals, stamens and style like those in the last species; pod $\frac{1}{4}$-$\frac{3}{8}$ in. oblong, expanded, straight, short-stalked, with a few silky black hairs 6-8. seeded.

Onobhrychis Stewartii.
LEGUMINOSÆ.
F. B. I. ii. 141.
The Plains.
Hazara (Stewart).
Rawalpindi (Aitchison)
Kot Futteh Khan.
Rawalpindi District. (Douie).

medium size, annual, stem slender, becoming smooth; leaves 3-4 in., including stalk, stipules linear, minute, leaflets 9-11, $\frac{1}{2}$-$\frac{3}{4}$ in. long, lanceolate with broad tip, nearly short-pointed, wide apart, somewhat hairy; flowers red, $\frac{1}{3}$ in., in long stalked axillary racemes, 6-9 in., bracts linear, minute; calyx $\frac{1}{12}$ in., bell-shaped, silky, teeth 5, lanceolate, petals 5, standard broad, smooth, veined, wings short, keel blunt, stamens 10, all united, style thread-like, incurved; pod $\frac{1}{6}$-$\frac{1}{3}$ in., kidney-shaped, expanded, faces woody, deeply honey-combed, edge armed with close minute spines, one-seeded. Douie found the stipules larger than minute, and the stamens not all united.

Hedysarum astragaloides.
LEGUMINOSÆ.
F. B. I. ii. 146.
Himalaya 11-12,000 ft.
Kishtwar (Thomson).
Lahul (Jaeschke).

medium size, stems robust, becoming grey velvety at first; leaves including the stalk, 4-8 in. long, leaflets 21-29, $\frac{3}{4}$-1 in., linear-oblong, blunt with a minute point, smoothish above, persistently grey velvety beneath; flowers $\frac{3}{4}$ in., red in very dense racemes 2-3 in. long, bracts linear thin projecting beyond the buds, calyx $\frac{1}{4}$ in., bell-shaped, finely silky, teeth 5, petals 5, standard shorter than the keel, keel blunt, stamens 10, upper free, lower ones united, style thread-like, very long, abruptly bent; pod stalked, distinctly one or two-jointed, joints oblong, thin, with a crisped wing below, less marked one above.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Hedysarum oachemirianum.
LEGUMINOSÆ.
F. B. I. ii. 146.
Kashmir, 9-10,000 ft.

medium size, stem robust, smooth, grooved; leaves including the stalk 6-12 in. long, leaflets 21-27, $\frac{3}{4}$-$1\frac{1}{4}$ in., long, linear-oblong, thin, blunt, both sides green, becoming smooth; flowers $\frac{3}{4}$-1 in., red in very dense racemes, 2-3 in., bracts linear, bristle-like, longer than the buds, calyx $\frac{3}{8}$ in., downy, teeth 5, petals 5, stamens and style as in the last species; pod of 1 to 3 joints, $\frac{1}{2}$-$\frac{3}{4}$ in. long, oblong, smooth, both sutures with a distinct uncrisped wing.

Hedysarum laxiflorum.
LEGUMINOSÆ.
F. B. I. ii. 146.
Himalaya, 9-12,000 ft.
Valley of Kishengunga (Winterbottom).

medium size, stems slender, firm, smooth; leaves including stalk, 3-5 in., leaflets 21-31, linear oblong, close, firm, nearly leathery, smooth above, grey, barely covered with grey velvet beneath; flowers $\frac{5}{8}$-$\frac{3}{4}$ in., red in loose racemes, 2-3 in., bracts minute bristle-like, calyx $\frac{1}{6}$ in., teeth 5, upper triangular, lower lanceolate, pod 3-4 jointed oblong, firm, smooth, rather expanded, not more than $\frac{1}{6}$ in., long; otherwise like the last species.

Hedysarum strobiliferum.
LEGUMINOSÆ.
F. B. I. ii. 146.
Kashmir, 9,000 feet (Falconer).

small, stem robust, thickly covered with short horizontal whitish hairs; leaves including the stalk, 6-8 in., leaflets 19-25, oblong-lanceolate, 1-$1\frac{1}{2}$ in., blunt, smoothish above, somewhat white-silky beneath; flowers less than $\frac{1}{2}$ in., yellowish, in dense racemes, 2-3 in., bracts overlapping, thin, dry, stiff, bristly quite hiding the buds, calyx $\frac{1}{3}$-$\frac{1}{4}$ in., tubular, teeth 5, short, triangular with sharp hard points petals 5, equal; stamens and style as in the last species.

Hedysarum microcalyx.
LEGUMINOSÆ.
F. B. I. ii. 147.
Himalaya, 9,000 ft.
Kashmir.
Lahul.

medium-size, stems stout, smooth, furrowed, leaves including the stalk, 6-9 in., leaflets 11-13, oblong-lanceolate, 1-$1\frac{1}{2}$ in., wide apart, blunt, both sides green, smooth; flowers $\frac{5}{8}$-$\frac{3}{4}$, bright red, in loose racemes, 2-4 in., calyx $\frac{1}{8}$ in., bell-shaped, smooth, thin, teeth 5, minute, triangular with a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

hard sharp point, petals 5, keel longer than standard, stamens and style as in the last species; pod 2-3 jointed, $\frac{1}{2}$-$\frac{5}{8}$ in., oblong, thin, smooth, both sutures distinctly margined.

Smithia sensitiva, *Oda-brini.* LEGUMINOSÆ. F. B. I. ii. 148. The Plains.

medium-size, annual, stems very slender, not bristly, much branched; leaves including stalk $\frac{1}{2}$-1 in., midrib bristly, stipules thin, dry with processes at the base, leaflets 4-20, $\frac{1}{4}$-$\frac{1}{2}$ in. long, sensitive, oblong, blunt, bristly on the midrib beneath and along the almost straight margins; flowers $\frac{3}{5}$ in., yellow, 1-6 in short stalked axillary racemes, calyx $\frac{1}{4}$-$\frac{1}{3}$ in., 2-lipped, lips entire, short-pointed, with a few scattered pale yellow bristles, petals 5, standard circular, keel incurved, blunt, stamens 10, in two bundles of five, style thread-like, incurved; pod of 4-6 joints, joints covered with minute nipple-like projections, folded together inside the calyx. This plant is eaten as a potherb, and forms a useful fodder.

Smithia geminiflora, LEGUMINOSÆ. F. B. I. ii. 149. Himalaya, 1-3,000 ft.

very like the last species, but with fewer leaflets, more bristles on the midribs and margins of leaflets, and the flowers in pairs in the axils of leaves.

Smithia ciliata, LEGUMINOSÆ. F. B. I. ii. 150. Himalaya, 3-6,000 ft. Simla, Naldera (Collett).

small to medium-size, annual, stem slender, not bristly; flowers in dense shortly stalked one-sided axillary racemes, bracteoles leafy, oblong with scattered bristles, calyx upper lip sharply cut off, lower lanceolate; otherwise like the two last species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Æschynomene indica, *Kath-sola.* LEGUMINOSÆ. F. B. I. ii. 151. The Plains to 5,000 ft. Kashmir. Valleys below Simla (Collett). Phalia, Gujrat District (Douie).

large, annual, pale green, stem smooth, branches many, cylindrical, often slightly rough with tubercles; leaves 2-3 in., stalk sticky with glands, stipules linear-lanceolate, long-pointed, with processes at the base, soon falling off, leaflets 41-61, sensitive, very small, upper ones smallest, overlapping, alternate, narrowly oblong, rounded with a small point; flowers $\frac{1}{3}$ in., yellow, often with purple streaks, in many, sticky, axillary racemes, bracts small, lanceolate, fringed with hairs, calyx $\frac{1}{6}$ in., smooth, deeply 2-lipped, lips faintly toothed, petals 5, standard circular, erect, keel nearly straight, blunt, stamens 10 in two bundles of five, style incurved, smooth; pod 1-1$\frac{1}{2}$ in. long, linear, stalked, flattened, smooth, straight or rather curved, upper suture straight, lower indented, joints 6-10, smooth or finally rough with nipple-like processes, one seed in each joint. The allied species *Æ. aspera*, yields the pith (sola) from which sun hats are made.

Uraria picta, *Dabra, deter.* LEGUMINOSÆ. F. B. II. ii. 155. The Plains to 6,000 ft.

large, perennial, stem finely downy, robust, branches few; leaves 10-12 in. long, lowest simple or of 3 leaflets, rounded or oblong, upper of 5-9 leaflets, mid stalk downy, stipules $\frac{1}{2}$ in., lanceolate, long-pointed, leaflets 4-8 in., linear-lanceolate, leathery, smooth, clouded with white above, net veined, minutely velvety beneath; flowers purple $\frac{1}{4}$ in., in dense cylindrical racemes, 6-12 by $\frac{5}{8}$-$\frac{3}{4}$ in., bracts brown, thin, soon falling off, minor flower stalks bristly, abruptly incurved, after flowering, at the tip, calyx $\frac{1}{5}$ in., tube very short, teeth 5, 2 upper short, lower long, bristle-like, petals 5, standard broad, wings united to the keel, stamens 10, upper one free, lower ones united, style thread-like, sharply bent; pod of 3-6 joints, joints small, swollen, one-seeded, polished, often placed face to face. The seeds are used to cure ulcerated mouths.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Cicer arietinum,
Gram or Chick-pea,
Chana.
LEGUMINOSÆ.
F. B. I. ii. 176.
The Plains to 2,000 ft.
Commonly cultivated.

small, annual, sticky, much branched; leaves 1-2 in., stipules small, obliquely ovate, with a few long teeth, strongly veined, leaflets 13 or so, $\frac{1}{4}$ in. long, ovate or oblong, deeply cut, strongly veined, flowers $\frac{3}{8}$ in., pink, blue or white, solitary axillary on stalks $\frac{1}{2}$-$\frac{3}{4}$ in., calyx $\frac{1}{4}$-$\frac{1}{3}$ in., teeth 5, linear, nearly equal, petals 5, standard broad, longer than the wings and keel, stamens 10, upper free, lower united, style incurved, beardless; pod $\frac{3}{4}$-1 in., swollen, velvety, sessile, narrowed into the persistent style, seeds 2 nearly round, reddish brown, black or white, indented, beaked.

Vicia tetrasperma,
LEGUMINOSÆ.
F. B. I. ii. 177.
Himalaya 6-8,000 ft.

medium size, annual, stem smooth, very slender much branched; leaves $\frac{1}{2}$-1 in., ending in twisted tendrils, stipules large, pointed, often toothed, base ending in a pointed lobe, leaflets 6-12, narrowly oblong, $\frac{1}{3}$-$\frac{3}{4}$ in., blunt or short pointed; flowers $\frac{1}{4}$ in., pale blue, in pairs or rarely solitary on axillary stalks equal in length to the leaves, calyx $\frac{1}{12}$ in., bell-shaped, teeth 5, three lower the longest, petals 5, longer than the calyx, standard broad, erect, keel nearly straight, blunt, shorter than the wing petals, stamens 10, upper one nearly or quite free, others united, style short, incurved, velvety all round: pod $\frac{1}{2}$ in., smooth, oblong, seeds 3 or 4.

Vicia Griffithii,
LEGUMINOSÆ.
F. B. I. ii. 178.
The Plains.
Rawalpindi.
Futtehjang (Aitchison).
Baluchistan (Duthie).

medium-size, perennial, stems slender, finely silky, thin, smooth, straggling; leaves 2 in., ending in twisted tendrils, stipules triangular, deeply cut, leaflets 12-16, $\frac{1}{8}$-$\frac{1}{4}$ in., wide apart, linear-oblong, thin, blunt; flowers $\frac{5}{8}$ in., lilac in 2-4 flowered, axillary racemes, as long as the leaves, calyx $\frac{1}{6}$ in., rather silky, teeth 5, upper triangular, lower lanceolate, pod $1\frac{1}{4}$ in., oblong, flat, smooth, veined, seeds 5-6; otherwise like the last species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Vicia sativa.
Vetch. or Tare.
LEGUMINOSÆ.
F. B. I. ii. 178.
The Plains to 7,000 ft.

small to medium size, annual, stems slender spreading or erect, rather downy; leaves pinnate ending in twisted tendrils, stipules small, obliquely lanceolate, deeply toothed, leaflets 8-12, those of upper leaves ½-1 in. strap shaped, of lower shorter, broader, sometimes deeply notched at the apex; flowers ⅔ in. or less, red-blue usually solitary, rarely in pairs, axillary, sessile, calyx ⅜ in., teeth 5, lanceolate-awlshaped, petals 5, twice the length of the calyx, style bearded below the stigma, pod 1-2 in., smooth, seeds 8-10; otherwise like the last species. A weed of cultivation, stated to be sometimes cultivated as a fodder plant.

Vicia peregrina.
LEGUMINOSÆ.
F. B. I. ii.
The Plains.

small, annual, slender, smooth, spreading, leaflets 10-12, alternate or opposite, ½-1 in. long, stipules minute, bifid with linear divisions; flowers ½ in. red purple solitary, on short axillary stalks, calyx ¼ in., teeth lanceolate, upper shorter curved upwards; pods 1-1¼ in., linear-oblong, abruptly turned down, smooth, rather curved, seeds 5-6; otherwise like the last species.

Vicia sepium.
LEGUMINOSÆ.
F. B. I. ii. 179.
Kashmir.

medium-size, perennial, finely downy; leaflets oblong, abruptly ended, stipules small, deeply toothed, flowers ⅔ in., reddish in 2-6 flowered, nearly sessile, one-sided, racemes only in the axils of upper leaves, calyx ⅓ in., smooth or downy, teeth triangular with a sharp hard point, pod 1 in., oblique, smooth, beaked, seeds 6-10; otherwise like the last species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Vicia narbonensis.
LEGUMINOSÆ.
F. B. I. ii. 179.
Peshawar (Vicary)
The Park at Rawalpindi.

medium-size, annual, stout, smooth or finely downy; leaflets 2 on the lowest leaves, 4-6 on the upper, 1-2 in. long, entire, obovate, stipules large, deeply cut; flowers $\frac{7}{8}$ in., purple and white, in nearly sessile 2-6 flowered racemes, calyx $\frac{3}{8}$ in., upper teeth triangular, lower lanceolate; pod $1\frac{1}{2}$-2 in., downy, 6-7 seeded; otherwise like the last species.

Vicia Faba.
Broad bean.
Bakla, chastang.
LEGUMINOSÆ.
F. B. I. ii. 179.
The Plains to 8,000 ft.

very like the last species, but larger. It is cultivated widely as a vegetable, and possibly may have once originated from *Vicia narbonensis*.

Lens esculenta.
Lentil.
Masur dal.
LEGUMINOSÆ.
F. B. I. ii. 179.
The Plains.
Baluchistan (Hughes-Buller.)

small, annual, softly velvety, branching from the base; leaves terminating in a bristle, stipules almost lobed at the base, leaflets 8-12, entire, lanceolate, often tipped with a small sharp point, sessile; flowers pale purple in 2-4 flowered racemes on stalks equal to the leaves, the end of the stalk extending beyond the flowers, calyx teeth linear, silky, petals 5, standard broad, wings joined to the keel, keel shorter than the wings, stamens 10, united into a tube with an oblique mouth, style abruptly bent, bearded on its inner face; pod $\frac{1}{2}$ in., long, oblong, flattened, smooth, seeds 2, grey with minute spots, flattened.

Lathyrus altaicus.
LEGUMINOSÆ.
F. B. I. ii. 180.
Himalaya 6-8,000 ft.
Chenab Valley (Royle.)

small, perennial, glabrous; leaves 2-3 in., terminated by a long tendril, stipules lanceolate with a tail-like point, slightly toothed, leaflets 6-8, $\frac{1}{2}$-$\frac{3}{4}$ in., broad, oblong, thin, with a bluish waxy gloss; flowers reddish, $\frac{3}{4}$ in., in 3-6-flowered loose one-sided racemes on stalks, 2-4 in. long, calyx $\frac{3}{8}$ in., 5-toothed, upper teeth triangular, lower linear

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

petals 5, standard broad, keel shorter than the wings, stamens 10, upper free, others united, style flattened, bearded on the inner side, pod cylindrical or flattish.

Lathyrus luteus.
LEGUMINOSÆ.
F. B. I. ii. 180.
Himalaya.
8-10,000 ft.
Mashobra.
Mahasu, Matiana.
Huttu (Collett).
Salt range.

medium-size, perennial, smooth; leaves 3-5 in., ending in a bristle, stipules large, leafy, base 2-lobed, leaflets 6-8, 2-4 in. long, thin, short-pointed, pale green; flowers 1 in., yellow, in 6-12-flowered stalked racemes, equal to or longer than the leaves, calyx $\frac{3}{8}$-$\frac{1}{2}$ in., teeth 5, upper triangular, lower lanceolate, pod 2-3 in., linear, beaked, seeds many; otherwise like the last species.

Phaseolus mungo,

see Prostrate Herbs, Alternate, Stipulate, Compound.

Phaseolus calcaratus.

see Prostrate Herbs, Alternate, Stipulate, Compound.

PETALS SIMILAR.

Cassia occidentalis.

see Shrubs, Erect, Alternate, Stipulate, Compound.

Cassia Sophera.

see Shrubs, Erect, Alternate, Stipulate, Compound.

Cassia Tora or obtusifolia.
Panwar.
LEGUMINOSÆ.
F. B. I. ii. 263.
The Plains to 5,000 ft.
Naldera.
Sutlej Valley (Collett)
Kangra Valley.

large, annual, shrub-like, not fœtid; leaves 2-4 in., stalked, stipules $\frac{3}{4}$ in., linear, soon falling off, main leaf-stalk grooved, conical gland between the lowest pair of leaflets, leaflets 6, 1-2 in. long, oblong-ovate with a broad triangular tip, obliquely rounded at the base, thin, green, smooth or rather velvety on both surfaces; flowers $\frac{1}{2}$ in. long, bright yellow in nearly sessile axillary pairs, calyx divided into 5 nearly to the base, lobes green, petals 5, nearly equal, stamens 10, 7 perfect, 3 minute,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

abortive, style incurved; pod 8-10 in., nearly cylindrical, divided by oblique partitions, sutures broad, seeds 30-35, flattened, brown shining. The leaves, seeds and root are used medicinally. It is a very common weed which flowers during the rains.

Cassia obovata or obtusa.
Indian Senna.
LEGUMINOSÆ.
F. B. I. ii. 264.
The Plains.
Delhi, Salt Range.
Dorajat.
Baluchistan (Boissier).

medium-size, annual or perennial, nearly smooth, branches angular; leaves 2-3 in., stalked, no gland between the leaflets, stipules lanceolate, persistent leaflets 8-12, ½-1½ in. long, oblong-ovate with a broad tip, rounded with a minute point, thin, a waxy bluish gloss beneath; flowers ¾ in., pale yellow in narrow few-flowered stalked racemes, 2-3 in., calyx segments blunt, smooth, stamens very unequal, pods 1-1½ in. long, shortly stalked, much curved; rounded at the ends, flexible smooth, seeds 6-12, separated by very thin partitions; otherwise like the last species.

Cassia absus.
Chaksu.
LEGUMINOSÆ.
F. B. I. ii. 265.
The Plains to 5,000 ft.
Valleys below Simla (Collett).
Dharmpur.

medium-size, annual or biennial, covered with grey sticky hairs; leaves 1½-3 in., long-stalked, a small gland on the main stalk between every pair of leaflets, stipules small, linear, persistent, short-pointed, leaflets 4, 1-2 in. long, oblong, blunt or nearly short-pointed, unequal at the base, hairy beneath as well as above; flowers ¼ in. diam., red-yellow in few flowered erect narrow short racemes, calyx of 5 narrow segments, ⅙-⅕ in. long, lanceolate, bristly, petals 5, nearly equal with long stalks, veined, stamens 5, equal, perfect; pod 1-1½ in., trap-shaped, oblique, seeds 5, flattened, dark-brown, shining.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

Spiræa aruncus, Meadow sweet.
ROSACEÆ.
F. B. I. ii. 323.
Himalaya, 8-10,000 ft.
Hattu (Collett).

large, perennial rootstock, shrub-like, smoothish; leaves 6-12 in., 2 to 3-pinnate, long primary and secondary leaf-stalks, leaflet-stalks short, stipules rudimentary, leaflets usually in threes, 1-3 in. long, ovate, sharply and irregularly toothed, narrowed into a tail-like tip; flowers $\frac{1}{6}$-$\frac{1}{4}$ in., many, white, one sexual, male and female on different plants, in long slender velvety branching racemes, calyx persistent, lobes 5, oblong, ovate, petals 5, orbicular, stamens 20 or more, sometimes united below, styles 5 or more, nearly terminal; follicles 6 or more, swollen, smooth, shining, seeds few. This plant is often mistaken for *Astilbe rivularis*, but the latter has no petals.

Ia albif olia,
ROSACEÆ.
F. B. I. ii. 347.
Himalaya, 8-10,000 ft.
Hattu, Bhagi (Collett).

small, perennial, rootstock stout, stems several, slender, zigzag, velvety, branched; leaves 2-4 in., pinnate, stalk very slender, stipules $\frac{1}{2}$-$\frac{3}{4}$ in., sheathing, loose, brown, short-pointed, united for half their length to the stalk, leaflets 5-9, $\frac{1}{4}$-1 in., ovate, deeply and sharply toothed, lateral leaflets diminishing from the uppermost pair downwards, green, velvety above, white-felted beneath; flowers $\frac{1}{4}$ in. diam., yellow, solitary on slender axillary stalks, 1-2 in., calyx persistent, tube shallow with 5 lobes, alternating with 5 bracteoles, white-felted, lobes triangular, bracteoles linear-oblong, petals 5, oblong, shorter than the calyx lobes, stamens 5, styles many, achenes many forming a head, hairy, covered by the calyx lobes, large, deeply furrowed, receptacle felted.

Potentilla fulgens,
ROSACEÆ.
F. B. I. ii. 165.
Himalaya, 6-9,000 ft.
Simla.
Mashobra (Collett).

small, perennial, rootstock stout, stem leafy, softly silky; leaves 2-8 in., pinnate, stalk stout, lower stipules dry, thin, upper leafy, toothed or lobed, leaflets many, in large and small pairs alternately, decreasing in size from above downwards, ovate, sharply toothed, terminal leaflet 1-1$\frac{1}{2}$ in.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

green, hairy above, silvery felted beneath; flowers ½ in. diam., yellow crowded in terminal clusters or branched racemes, bracteoles quite entire or 2-3-fid, calyx silvery hairy, lobes ovate, short-pointed, petals orbicular, ovate with a broad tip, stamens many, styles short, slender, ventral, achenes small, smooth; otherwise like the last species.

Potentilla Clarkei.
ROSACEÆ.
F. B. I. ii. 351.
Himalaya 7,000 ft.
Srinagar.
Kashmir (Clarke).

small, perennial, rootstock woody, stem stout, ascending, leafy, rough with long spreading hairs; leaves 1-2 in., covered with spreading hairs, stipules on the stem, leafy, large, half ovate, entire or toothed, leaflets ½-1 in., 5-7, ovate with a broad tip, very coarsely round-toothed, ⅓ way down, sessile, close together; flowers ½ in. diam., yellow stalked, very stiff in clusters with very spreading leafy branches and bracts; calyx lobes short-pointed, petals ovate with a broad tip, stamens many, styles slender, terminal, achenes many, large minutely wrinkled on a raised hairy receptacle; otherwise like the last species.

Potentilla sericea.
ROSACEÆ.
F. B. I. ii. 354.
Himalaya 9-17,000 ft.
Kashmir.

small to medium-size according to elevation, rootstock erect, very stout, stems many, white, densely silky-felted; leaves 1-6 in., crowded about 1 in. broad, leaflets 5-11, oblong, silky on both surfaces, all cut nearly to the midrib, terminal leaflets radiating, lateral, opposite and alternate; flowers ¼-¾ in. diam., yellow on flowering stems, densely felted, in many or few flowered clusters or solitary, calyx lobes triangular-ovate or lanceolate bracteoles narrowly oblong, blunt, petals orbicular, ovate with a broad tip, styles terminal, achenes many, smooth; otherwise like the last species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

Potentilla nepalensis, *Rattanjot,* ROSACEÆ. F. B. I. ii. 355. Himalaya, 5-9,000 ft. Simla (Collett). Murree.

medium-size, perennial, stout or slender, softly hairy to nearly smooth, stem branched, leafy; leaves digitately compound, radical 12 by 3 in., long-stalked, leaflets 5, 1-3 by $\frac{1}{4}$-$1\frac{1}{4}$ in., sessile, stem stipules $\frac{3}{4}$-1 in., ovate or oblong, lower entire, upper lobed, leaflets ovate with a broad tip or rounded, coarsely toothed, green; flowers $\frac{2}{3}$-1 in. diam., purple, stalked in forked branching racemes, calyx lobes short-pointed, bracteoles blunt, petals reversed heart-shaped, longer than the calyx lobes, achenes very many, minute, wrinkled on a round hairy receptacle; otherwise like the last species.

Potentilla kashmirica, ROSACEÆ. F. B. I. ii. 355. Kashmir, 7,500 ft. Nowgunge (Clarke).

very like the last species, but with shorter leaf stalks, shorter more deeply toothed leaflets, yellow flowers, more deeply wrinkled achenes, and broadly clustered flowers.

Potentilla argentea, see Herbs, Unbranched, Alternate, Stipulate, Compound.

Agrimonia eupatorium, see Herbs, Unbranched, Alternate, Stipulate, Compound.

Agrimonia pilosa, see Herbs, Unbranched, Alternate, Stipulate, Compound.

FLOWERS, MINUTE, IN UMBELS.

Vicatia coniifolia, see Herbs, Erect, Alternate, Exstipulate, Compound.

Vicatia millefolia, see Herbs, Erect, Alternate, Exstipulate, Compound.

Elaeosticta meifolia, see Herbs, Erect, Alternate, Exstipulate, Compound.

Apium graveolens, see Herbs, Erect, Alternate, Exstipulate, Compound.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

Cicuta virosa, see Herbs, Erect, Alternate, Exstipulate, Compound.

Carum Carui, see Herbs, Erect, Alternate, Exstipulate, Compound.

Carum Bulbocastanum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Carum Roxburghianum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Carum copticum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Sium latijugum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Pimpinella saxifraga, see Herbs, Erect, Alternate, Exstipulate, Compound.

Pimpinella acuminata, see Herbs, Erect, Alternate, Exstipulate, Compound.

Pimpinella diversifolia, see Herbs, Erect, Alternate, Exstipulate, Compound.

Osmorrhiza claytoni see Herbs, Erect, Alternate, Exstipulate, Compound.

Chœrophyllum virosum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Chœrophyllum reflexum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Chœrophyllum capnoides, see Herbs, Erect, Alternate, Exstipulate, Compound.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

Chœrophyllum cachemiricum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Scandix Pecten-Veneris, see Herbs, Erect, Alternate, Exstipulate, Compound.

Anthriscus nemerosa, see Herbs, Erect, Alternate, Exstipulate, Compound.

Seseli sibiricum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Pycnocycla glauca, see Herbs, Erect, Alternate, Exstipulate, Compound.

Fœniculum vulgare, see Herbs, Erect, Alternate, Exstipulate, Compound.

Prangos pabularia, see Herbs, Erect, Alternate, Exstipulate, Compound.

Ligusticum marginatum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Selinum tenuifolium, see Herbs, Erect, Alternate, Exstipulate, Compound.

Selinum papyraceum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Selinum Candolii, see Herbs, Erect, Alternate, Exstipulate, Compound.

Selinum vaginatum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Pleurospermum Govanianum, see Herbs, Erect, Alternate, Exstipulate, Compound.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

Pleurospermum Candolii. see Herbs, Erect, Alternate, Exstipulate, Compound.

Pleurospermum angelicoides, see Herbs, Erect, Alternate, Exstipulate, Compound.

Pleurospermum stylosum. see Herbs, Erect, Alternate, Exstipulate, Compound.

Pleurospermum densiflorum. see Herbs, Erect, Alternate, Exstipulate, Compound.

Pleurospermum Brunonis. see Herbs, Erect, Alternate, Exstipulate, Compound.

Angelica glauca. see Herbs, Erect, Alternate, Exstipulate, Compound.

Archangelica officinalis. see Herbs, Erect, Alternate, Exstipulate, Compound.

Ferula Thomsoni. see Herbs, Erect, Alternate, Exstipulate, Compound.

Ferula Jœschkeana. see Herbs, Erect, Alternate, Exstipulate, Compound.

Peucedanum graveolens. see Herbs, Erect, Alternate, Exstipulate, Compound.

Peucedanum Thomsoni, see Herbs, Erect, Alternate, Exstipulate, Compound.

Heracleum Thomsoni. see Herbs, Erect, Alternate, Exstipulate, Compound.

Heracleum pinnatum. see Herbs, Erect, Alternate, Exstipulate, Compound.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

Heracleum cachemiricum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Heracleum canescens. see Herbs, Erect, Alternate, Exstipulate, Compound.

Heracleum candicans. see Herbs, Erect, Alternate, Exstipulate, Compound.

Zosimia absinthifolia. see Herbs, Erect, Alternate, Exstipulate, Compound.

Coriandrum sativum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Cuminum Cyminum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Daucus Carota, see Herbs, Erect, Alternate, Exstipulate, Compound.

Caucalis Anthriscus, see Herbs, Erect, Alternate, Exstipulate, Compound.

Caucalis leptophylla. see Herbs, Erect, Alternate, Exstipulate, Compound.

Caucalis latifolia. see Herbs, Erect, Alternate, Exstipulate, Compound.

Psammogeton biternatum, see Herbs, Erect, Alternate, Exstipulate, Compound.

PETALS NONE.

Thalictrum cultratum, see Herbs, Erect, Alternate, Exstipulate, Compound.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS NONE.

Thalictrum reniforme, see Herbs, Erect, Alternate Exstipulate, Compound.

Thalictrum Javanicum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Thalictrum foliolosum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Astilbe rivularis, SAXIFRAGACEÆ. F. B. I. ii. 389. Himalaya, 4-9,000 ft. Simla, Mashobra (Collett). Kashmir. Dalhousie.

large, rootstock perennial, hairy; leaves 6-18 in., irregularly 2-pinnate, stipules large, thin, united to the leaf stalk, sheathing, base of leaf stalk enlarged, hairy, leaflets 1-4 in., ovate, sometimes lobed, heart-shaped at the base, sharply toothed, long-pointed, smooth above, minutely bristly beneath along the midrib and nerves; flowers very small, greenish-yellow, sometimes one sexual in spicate racemes, forming a large terminal branching raceme, 12-24 in. long, stalk of raceme softly hairy, calyx bell-shaped, united to the base of the ovary, lobes 5, deeply divided, persistent, petals none, stamens 5, opposite the sepals, styles 2; capsule small 2 beaked, seeds minute, many, narrow tailed at both ends, sometimes mistaken for *Spiræa Aruncus*, whose fruit has 3-4 beaks.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PROGRESS OF THE MAMMAL SURVEY.

When the last account was written in March 1912 (p. 640 of the last Journal) Mr. Crump was commencing to collect in Hoshangabad. From there he proceeded to Pachmarhi for a short spell and then to Saugor, Damoh, Balaghat and Chanda, all in the Central Provinces. He was unable to stay long in each district but managed to obtain some 519 specimens by the 12th July.

As the rains will probably set in by the latter part of June, it is proposed to bring Mr. Crump back then and a little later to send him to Sind where the rainfall is light and collecting of mammals will be practicable.

Mr. D. O. Witt, I.F.S., kindly rendered much valuable aid to Mr. Crump in the Saugor District and to Mr. Chevenix Trench, I.C.S., the thanks of the Society are also due to Mr. F. J. Langhorne, I.F.S., for the assistance rendered in the Damoh District and to Mr. C. G. Leftwich, I.C.S., in the Chanda District.

Mr. Shortridge has been steadily collecting in Kanara and has stayed at the following centres Samasgi, Sirsi, Hulekal, Jog, Gersoppa and Honawar from whence he has sent some 506 specimens up to June 4th.

He is now near Shimoga (Mysore territory) having completed Kanara and his proceeding towards Mysore and then to the Eastward and it is proposed as soon as the worst of the rains are over that he should proceed to Coorg, the Shevaroys, Nilgiris, Anamallays and Palneys where excellent results may be hoped for—but such a programme must, of course, take a very considerable time.

It will be noticed that the subscription list has made but little progress since the last list was published. The most satisfactory feature about it is the promised contribution from the Government of Madras who have kindly offered a grant of Rs. 2,500 towards the Survey. This grant is greatly appreciated and it is earnestly hoped that other Governments will follow this excellent example, particularly since the work which we are endeavouring to do is for the whole of India, Burma and Ceylon. It is also Imperial since we are giving specimens to the Imperial collection at the British Museum, South Kensington.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

So far we have spent about Rs. 13,000 or roughly half the amount collected, and therefore if the work is to be completed a large amount of money has yet to be obtained.

MAMMAL FUND.

FURTHER LIST OF SUBSCRIBERS UP TO 31st MAY 1912.

Name.	Amount.		
	Rs.	A.	P.
Amount previously acknowledged in Journal No. 2, Vol. XXI	26,398	5	0
Andrews, G. P.	16	0	0
Bagshawe, L. V.	15	0	0
Blunt, H. R.	10	0	0
Bowen, J. C. G.	30	0	0
Burnett, Prof. K.	7	8	0
Cadell, P. R.	30	0	0
Coode, J. M.	15	0	0
Delme-Radcliffe, Lt.-Col. H.	15	0	0
Forsyth, Dr. Wm.	5	8	0
Gaye, W. C. (2nd Donation)	10	0	0
Gordon, R. G.	50	0	0
Gray, Chas.	25	0	0
Hannyngton, F.	15	2	0
Henderson, Dr. J. R.	25	0	0
Hyam, Judah	10	0	0
Jamkhandi, H. H. The Chief	100	0	0
Laurence, T. R.	15	0	0
Manners Smith, Lt.-Col. J.	15	0	0
Muspratt, Lt.-Col. F. C.	30	0	0
Royal Society, The .. .. .. £25 ..	372	12	0
Stables, Major A.	15	12	0
Suter, Dr. M. F. (Rs. 10 per month-March, April and May)	30	0	0
Total ..	27,255	15	0
Promised by the Government of Madras, Rs. 2,500.			

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MISCELLANEOUS NOTES.

No. I.—NOTES ON TIGERS.

With reference to Mr. Pitman's note under the above heading (Vol. XXI, No. 2, page 657) I would draw attention to Capt. Forsyth's remarks in "the Highlands of Central India," pp. 267, *et seq.*, 1899 edition. He states that regular cattle-lifters are known to natives as "*oontia bagh*" from his faintly striped coat resembling the colour of a camel. The author's explanation is that cattle-lifters are usually larger, older, and heavier animals than game killers and have taken to a cattle diet owing to a decreasing activity with advancing age. He wrote: "The larger and older the animal, the more yellow his coat becomes and the fainter and further apart are the stripes."

COIMBATORE, *16th May* 1912. C. E. C. FISCHER, I.F.S.

In the last issue of the Journal Mr. Pitman contributes two letters about tiger in the C. P. His experience of three cubs to the litter is unusual. I have shot and seen shot 8 or 10 tigresses, and I have not found more than two cubs carried. I have recently come across a tigress running with three cubs, one of which I shot. It was about three years old but the other two appeared to be a year old. As regards colouration in the hot weather Mr. Pitman's experience agrees with mine. The regular cattle killer is a fat beast, and his colour in the hot weather is very pale. The tiger who lives chiefly on game in the interior of forests is a much harder animal and keeps his colour even in the summer months. It is probably not a matter of protective colouring for the tiger in the daylight is always very conspicuous, his colour being obviously intended for the twilight. The darker colour of the tiger that does not live on cattle is probably due to his greater fitness.

BALAGHAT, C.P., *4th May* 1912. F. DEWAR, I.C.S.

Mr. Pitman refers to the number of cubs in the tigress's litter in your issue of the 31st March last. I believe that four is not an unusual number to be found in the fœtus stage, but my experience goes to show that tigresses are seldom accompanied by more than two cubs, which points to the probability of not more than that number surviving.

As regards colouration of tigers, the differences noted by Mr. Pitman are probably due principally to age. At the same time animals inhabiting dense jungle are likely to be darker coloured than those of more open localities.

As tigers grow in age and weight, they are probably more addicted to cattle killing than game killing; it is an easier occupation. Old tigers lose

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

their brilliant colouring, and are sometimes quite faded, both as to the fulvous ground colouring and the stripes.

R. G. BURTON, LIEUT.-COLONEL,
94th Russell's Infantry.

CAMP, 23rd *April* 1912.

[The Raja Saheb of Mudhol (Kolhapur) has lately presented to the Society the skins of 4 tiger cubs which he said were cut out of a tigress shot in N. Kanara this hot weather.—EDS.]

During the Viceroy's shoot at Moband (Siwaliks) last week a tigress 8 foot 9 inches was shot. Out of her were cut six fully formed cubs, 2 males and 4 females. Would you be so good as to inform me if you have ever heard of six being found before and if it is a rare occurrence?

V. A. S. KEIGHLEY, CAPT.,
Viceroy's Bodyguard.

DEHRA DUN, 30th *April* 1912.

[We have not heard before of more than five cubs being found in a tiger's litter.—EDS.]

No. II.—NOTES ON PANTHERS.

Remarks regarding ten panthers whose skulls are presented to the Society, all recently shot in Buldana District, Berar.

Date on which Skull shot marked.	Sex.	Length of panther in straight line. Head and body.	Tail.	General Remarks.
31-3-12	Female.	3 ft. 8 in.	2 ft. 6 in.	Fully mature, as evident from teeth. Bright smooth coat; skull ridged; the rosettes about the centre of this animal's back have many central spots, as in the jaguar, a peculiarity I have not observed in others of the species, although there are occasionally two or three such spots.
6-4-12	Male.	3 ft. 6 in.	2 ft. 8 in.	Immature. Rough, fulvous coat. No occipital ridge.
10-4-12	Male.	4 ft. 3 in.	2 ft. 9 in.	Old; bright, smooth skining coat, skull ridged and elongated.
15-4-12	Female.	3 ft. 3 in.	2 ft. 5 in.	Immature, but living by itself. Rough coat. No occipital ridge.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

16-4-12	Female.	3 ft. 7 in.	2 ft. 7 in.	Old and has had young. Bright smooth coat; ridged skull.
19-4-12	Female.	3 ft. 4 in.	2 ft. 6 in.	Young; has not borne young. Dull, rough coat. No occipital ridge.
21-4-12	Female.	3 ft. 6 in.	2 ft. 5 in.	Young, as evident from teeth. Thickly spotted, dark rough fur. No occipital ridge.
23-4-12	Male.	4 ft. 2 in.	2 ft. 6 in.	Old. Very smooth, bright, shining coat. Ridged skull.
25-4-12	Female.	3 ft. 8 in.	2 ft. 6 in.	Mature. Appears to have had young. Pale colour, coat smooth. Ridged skull.
15-5-12	Male.	4 ft. 6 in.	2 ft. 9 in.	Very old. Dark colour, smooth coat. Ridged skull. This panther had a peculiar malformation of the tongue which was split in two for about four inches from the point.

Note.—In determining whether these animals were young, immature or old, I have not considered the presence or absence of occipital ridge, or the smoothness or otherwise of the fur. But have judged from the appearance of the teeth and sexual indications. It will be observed that in old animals there is invariably a strongly developed occipital ridge, an elongated appearance of the skull, and generally a bright, smooth coat. In young animals there is no occipital ridge, and the skull is rounder, while the coat is generally rough and has less pigmentation. Males are, of course, as in all the cats, much larger than females. These animals were all shot within a small area. They were all driven out singly, and were therefore sufficiently mature to be living alone. The old and the young respectively present those features which have sometimes led to their being divided into two species. They are undoubtedly all of one species, the features referred to being merely indications of age, such as one would naturally expect and not peculiar to this species.

In the Journal of 31st March, Captain Mosse reviews Mr. Hick's remarks on panthers and *pantherets* (!) in his book "Forty years among the wild beasts of India." I have already discussed this matter at length in another publication (*Pioneer*, October 1910). The experience of many years leads me to the conclusion, confirmed by recent observation, that the difference, between the two so-called species are generally, if not invariably, due to age. Size is no criterion; these, like other animals, vary in this respect, and it is impossible to draw a dividing line. As for measurements I doubt whether any female panther's head and body has measured as much as five feet in length, and I have never seen a panther with a tail as short as 2 feet; much depends, moreover, on the system of measurement, whether round the curves of the body, or in a straight line. Young

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

panthers, like young tigers, have rough skins. I have never seen an old panther with no occipital ridge.

The statement as to the number of caudal vertebræ is to be found in Sterndale's Natural History, where that author quotes Temminck. It would be interesting to know whether Mr. Hicks derived his statement from that source, or whether it is the result of personal observation.

R. G. BURTON, LIEUT.-COLONEL,
94th Russell's Infantry.

BARODA, *May* 1912.

[Possibly Mr Hicks, if he sees this note, may be disposed to forward his panthers' skulls and skins to the Society for examination.—EDS.]

No. III.—A LARGE OORIAL HEAD.

The other day I had the good fortune to secure two very good Oorial heads and thought that perhaps a photograph of one of them might be of interest. They were both shot in the same hill, Khair Murat by name, within 25 miles of Rawalpindi. The smaller head measuring 30″ in length, and 10″ circumference at base of horn, is in some respects the handsomer owing to its wide spread and larger radius. The measurements of the larger head as certified to by some friends are :—

Length	Right horn $36\frac{3}{8}$ in.	Left horn $37\frac{1}{4}$ in.
Circumference ..	Right horn $9\frac{1}{2}$ in.	Left horn $9\frac{3}{4}$ in.

If the tips of both horns were not broken they would probably measure close on $38\frac{1}{2}$ in.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Can you tell me if this is the authenticated record for Cis-Indus? The Trans-Indus Wana record is, I believe, 40 in. obtained sometime during the last hot weather. I see the *Indian Field Shikar Book* mentions one of 38½ in. shot near Attock, but it does not seem to be authenticated.

This same book implies that the Oorial and the Shapoo are indentical. Is this correct? I have never shot Shapoo but have shot a considerable number of Oorial, and have seen a great many of their heads from Baluchistan, Wazristan and Cis-Indus. I have certainly seen some Shapoo heads in which the ends of the horns seemed to curve back slightly something like Burrhel horns, but I have never seen this in a single Corial head.

H. V. BIGGS, COLONEL.

RAWALPINDI, *6th January* 1912.

[The Oorial or Shapoo are practically the same, the Shapoo being the Ladak name for the Oorial. The Cis-Indus variety is *Ovis vignei cycloceros* and the record head, according to Rowland Ward's "Records of Big Game, (5th Edition)" is 39½ (length on front curve), 10¾ (circumference), Punjab (locality), Major F. H. Taylor (owner). We reproduce the photograph of Colonel Bigg's 37¼ Oorial.—EDS.]

No. IV.—THE SO-CALLED ONE-HORNED SHEEP OF NEPAL AND OTHER BREEDS.

(*With a Plate.*)

I send a photograph of three of the typical breeds of Sheep in Nepal. The Prime Minister Maharaja Sir Chandra Shum Shere Jung has very kindly collected and presented me with a pair each of these three kinds of Sheep.

The Sheep in the photograph are as follows:—

(1) Barwal (ram).
(2) Do. (ewe).
(3) Hunia (ram).
(4) Do. (ewe).
(5) Kagi (ram).
(6) Do. (ewe).
(7) Do. (lamb).

The rams of Barwal and Kagi make good fighting rams. The Hunia is sometimes used as a beast of burden. All three kinds are short-tailed sheep. There is another breed of Tibetan sheep which sometimes comes to Nepal, *viz.*, the Silling, which is the sheep mostly used to carry burdens. The Maharaja has not yet succeeded in obtaining a typical pair of these, but I believe they may be procured later.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

TYPICAL BREEDS OF NEPAL SHEEP.

1. *Barwal* (*ram*).
2. *Do.* (*ewe*).
3. *Hunia* (*ram*).
4. *Do.* (*ewe*).
5. *Kagi* (*ram*).
6. *Do.* (*ewe*).
7. *Kagi* (*lamb*).

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The small photograph is that of the so-called "unicorn" sheep. These sheep are "Barwals" and are really two horned sheep which have been converted into a one horned variety.

The Prime Minister has sent me the result of the enquiries instituted by him. The report is that to make the unicorns, the lambs when about 2 or 3 months old are branded with red-hot irons where the horns are sprouting. This prevents the horns from growing in the usual places and induces them to come out joined together from the top of the skull.

J. MANNERS-SMITH,
Lieut.-Colonel.

THE RESIDENCY,
NEPAL, 27*th March* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. V.—SOME NOTES FROM THE ABOR EXPEDITION.

I send a Kakur (*Cervulus aureus*) head showing three distinct horns, or, if a small stud is counted, which is quite separate, it has four horns.

I found it in this village and thought it would be a nice addition to our museum.

I have discovered that the Takin (*Budorcas taxicolor*) extends into the Dihong Valley, for an Abor has a head here, which was taken off an animal which was washed down the river two rains ago. It must have come from some distance further up, as no one here had ever seen one before.

The *red* serow is quite common. I have got an 11½ inch head.

I have not found the true Mahseer (*Barbus tor*) as high as this though 20 miles lower down they are common.

Here I have only caught the "boka" or "kalabano" and got one of 20 lbs. amongst a dozen or so over 15 lbs.

ALBAN WILSON, MAJOR,
8th Gurkhas.

GEKU, ABOR FIELD FORCE,
ASSAM, 12*th February* 1912.

No. VI.—DO CHINKARA (*GAZELLA BENNETTI*) DRINK WATER?

Your correspondent, Mr. Pitman, refers to this question in the Journal of 31st March last. He will find that I fully discussed the matter in an article on "The drinking habits of wild animals" in 1908, in the Journal Vol. XVIII, p. 250?

The error as to these animals being "said never to drink" appears to have originated with the late Dr. Blanford, who has been followed by other writers. I have recently had my previous observations confirmed by seeing large numbers of this gazelle trooping down to drink in the middle of the day during a particularly dry season.

R. G. BURTON, LIEUT.-COLONEL,
94th Russell's Infantry.

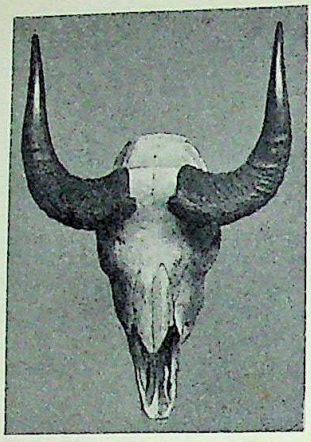
CAMP, *April* 23*rd*, 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

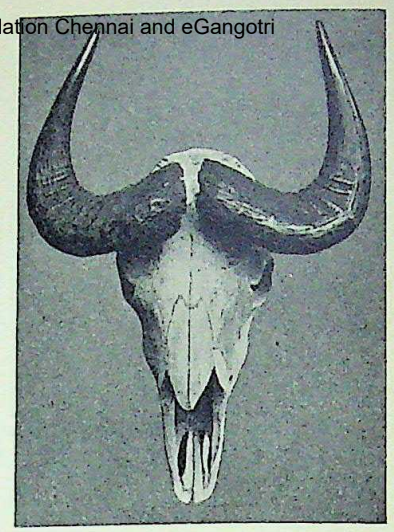
Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

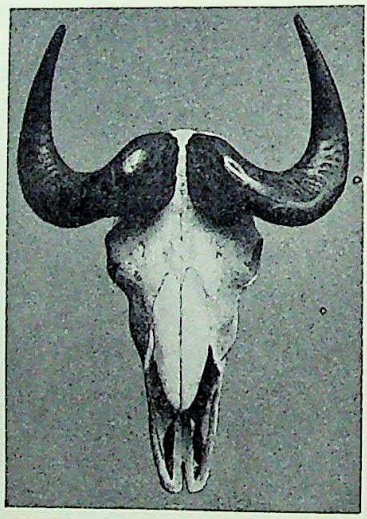
Digitized by Arya Samaj Foundation Chennai and eGangotri



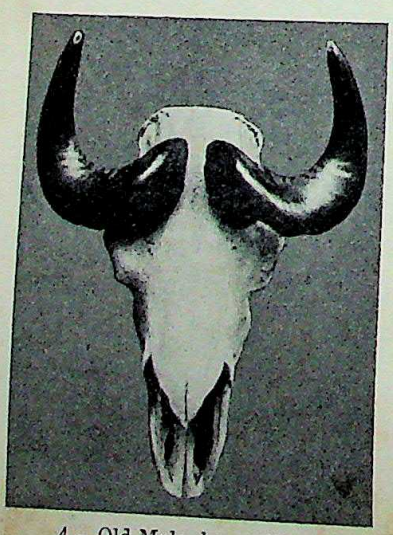
1.—Young Male, horns 14¼"



2.—Male, horns 18¼" and 18½"



3.—Adult Male, horns 20¼"



4.—Old Male, horns 17⅛"

5.—Female, horns 15"

HEADS OF TAKIN, *Budorcas taxicolor* (front view), FROM THE MISHMI COUNTRY.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mr. Pitman's experience of Chinkara drinking is very interesting. In his recent book Mr. Stebbing notes that the Chinkara is a desert animal and the more dry and sandy a place the better it suits him. Personally though I have often seen deer drinking, I have never seen an antelope do so, neither a Bluebull, a Black buck, a Fourhorn nor a Chinkara. They are keen on perennial streams and their neighbourhood, but chiefly for the sake of fresh young grass. In my experience antelopes are much harder than deer, and I have attributed this partly to the fact that they seldom drink water. I should be glad to hear whether anyone else has seen an antelope drink?

F. DEWAR, I.C.S.

BALAGHAT, C. P., *4th May* 1912.

No. VII.—RECOVERY OF ANIMALS FROM INJURIES.

In some of your recent issues I have seen notes of some remarkable recoveries from injuries in beasts and birds. The other day two such cases came to my notice. The first was a Sambhur stag, full grown, which was going perfectly well and sound when I shot him. On examination I saw a large hard thickening in the bone of the off hind leg below the hock. I skinned the part carefully and found that the bone had been fractured and set again without any shortening. From its appearance it must have been when the animal was quite young.

The second case was a solitary boar which I shot. He was a big beast 35½″ at the shoulder with good tusks. There was a healed scar on his right shoulder and a soft lump which turned out to be an abscess full of fœtid matter. Thinking it an old bullet wound I examined further and found the point of a boar's tusk about 2½″ long firmly embedded in the bone of the shoulder blade where it had snapped off short. The external wound had healed up completely and the animal showed no signs of lameness.

W. J. H. BALLANTINE,
ASSISTANT POLITICAL OFFICER.

SADIYA, UPPER ASSAM,
5th January 1912.

No. VIII.—NOTE ON TAKIN (*BUDORCAS TAXICOLOR*).

With 2 Plates.

In July of last year when just north of the Mishmi Hills at an altitude of about 10,000 feet, I was fortunate in finding a place frequented by a herd of Takin. This herd about 300 in number spent each night in the vicinity of a hot spring drinking the water and browsing on the trees around it. I

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

had a good opportunity of watching them for several days at a distance of about 80 yards as they emerged from the rhododendron and willow jungle to drink the hot water.

The first thing that strikes one on seeing the herd of animals is, the great variety of colour, ranging from very dark grey to a golden yellow: the animals are all conspicuously lighter on the withers and have a darker dorsal stripe. The very young ones are quite dark, the dorsal stripe being inconspicuous ; the females are also dark having no trace of the yellow which is seen on the males. Adult males are light yellow over the withers and back and darker in other parts, while the very old and large males are a darker yellow.

The horns of the young grow straight up from the head with an outward tendency ; later they grow outwards and upwards (see fig. 1); in the final stage the horns grow forwards, bend downwards and outwards, with the points growing up (see figs. 2 & 3). The horns are very deceptive as regards length, and even at a short range with a telescope it is difficult to pick a good head. The points of the horns of a young male which have not yet curled may be higher above the occiput than those of an older animal, a fact which makes it difficult to distinguish a large pair of horns. In shooting the animals I found it best to disregard the horns and to shoot the animals of largest size. The old males are quite easy to recognise being very much more bulky than the others and being darker in colour than the younger males.

In the figure which accompanies Mr. Pocock's paper in Vol. XIX of the Journal the neck appears to be too long and not nearly thick enough. The horns are longitudinally wrinkled and irregularly transversely ringed at the base but old horns (see fig. 4) are much smoother and the points being worn down, they are also shorter.

Takin are possessed of a very keen sense of smell but their alarm even when fired at, quickly subsides and they returned to the hot spring a few minutes after being driven away. Only on one occasion did I hear a sound uttered by these animals; this was a snort of alarm given by a female who walked up to where I was standing and did not see me until she was within six or eight feet ; on hearing this the herd galloped off. On other occasions when alarmed, they were off without making any sound.

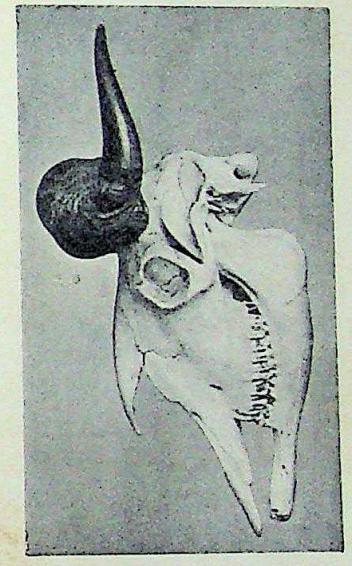
In the day time this herd remained in the dense rhododendron forest, but at 3 or 4 o'clock in the afternoon they would come down to the hot spring and stand in the water in a dense crowd sometimes pushing and bustling each other in their eagerness to drink the water. It is probable that they remained here all night, as before daylight they were still in and near the spring and could be seen browsing on the willows trees near the water. I was told that in winter no Takin are found at the hot

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

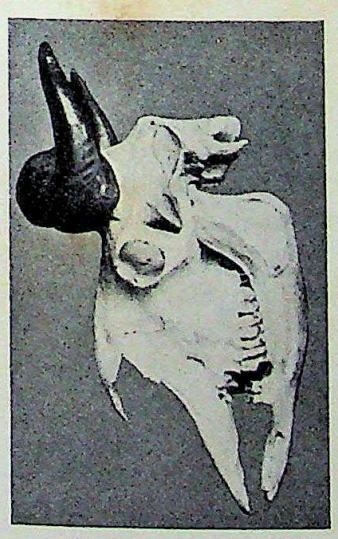
Digitized by Arya Samaj Foundation Chennai and eGangotri

1.—Young Male, horns 14¼″

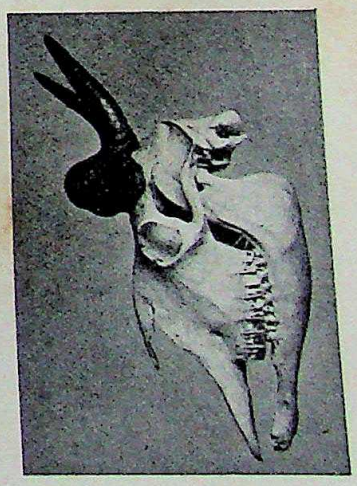
2.—Male, horns 18¼″ and 18½″



3.—Adult Male, horns 20¼″



4.—Old Male, horns 17⅛″



5.—Female, horns 15″

HEADS OF TAKIN, *Budorcas taxicolor* (side view), FROM THE MISHMI COUNTRY.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spring, but that this large herd breaks up into parties of 10 or 20 when it is with difficulty that the native hunters can find and shoot them. They are large heavy animals and should be shot with a heavy rifle.

The ground on which I saw these animals as well as that on which I saw tracks near Ta Chien Lu in Ssuchuan was steep, but it cannot have been nearly so steep as that which the late Mr. Brook describes.

I collected a good set of skins of different ages and sexes but unfortunately none of these survived the continual rain which fell when they were shot and while they were being carried back to India.

The Chinese name for Takin is "Ye-Niu" meaning "wild cattle." Near Tachien Lu the Tibetans call them "Ya-Go," but near Rima the Tibetan name is "Shing-Na." To the Miju Mishmis (*i.e.*, those living near Rima) they are known as "Kyem," while the Mishmis up the Dibang river (Chulik Atta tribe) call them "Akrön." The Abor name is "Siben-ö". Takin is the name used by the Digaru Mishmis who inhabit the country where the Lohit river approaches the plains.

The following are some measurements of those obtained :—

	Sex.	Head & Body.	Tail.	Ear.	Height.	Horns.
Number 1. (figs. 1, Pl. A. & B.)	Male	5′ 9″	4″	4″	3′ 3″	14¼″
„ 2. (figs. 2, Pl. A. & B.)	Male	..	..	..	..	18¼″ 18½″
The above two animals had very yellow coats.						
Number 3. (figs. 3, Pl. A. & B.)	Male	6′ 4″	..	..	..	20¼″
„ 4. (figs. 4, Pl. A. & B.)	Male	6′ 4″	4″	4″	4′ 5½″	17⅛″
These two were very large in size and darker than Nos. 1 and 2.						
Number 5. (figs. 5, Pl. A. & B.)	Female	5′ 6″	..	..		15″
„ 6.	Female	5′ 7½″	..	..		14¼″

F. M. BAILEY, CAPT.

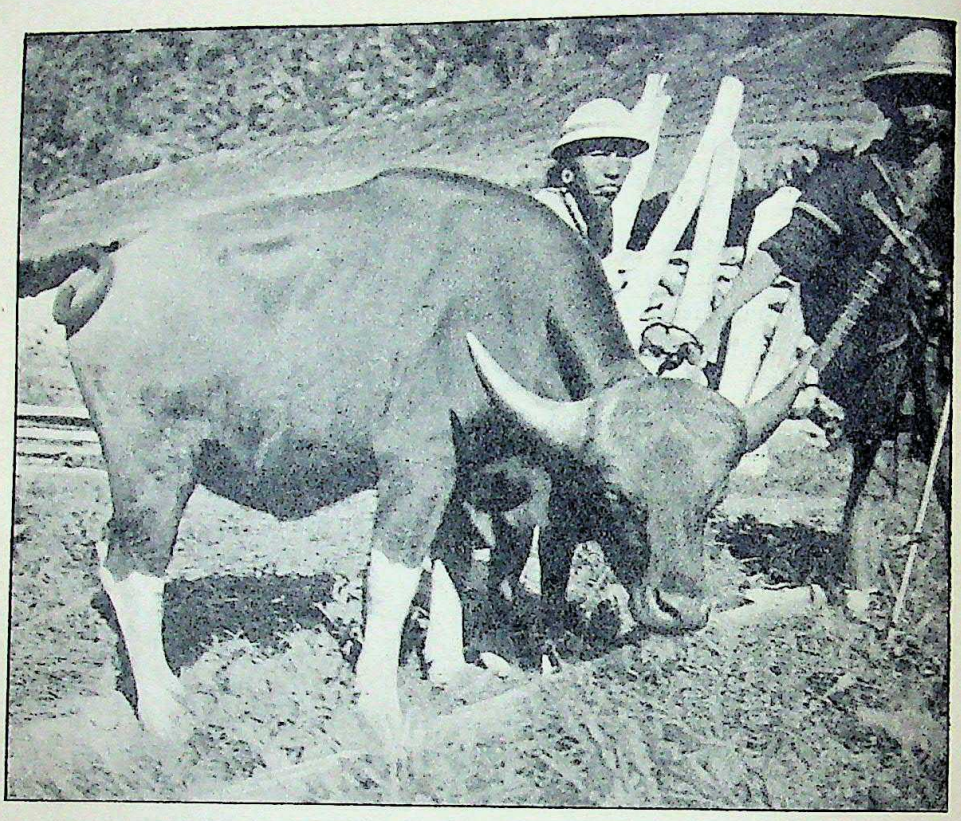
ALIGARH, U. P., *March* 1912.

No. IX.—GAYAL OR MITHAN (*BIBOS FRONTALIS*).

The photo here reproduced is that of a tame Mithan and was taken in a Mishmi village. The Mishmis and Abors keep a few of these cattle. They are not milked. Specimens are as a rule similarly coloured though I have seen one with a white head. There are no wild Mithan in the Mishmi or Abor hills. I was once shown a skull which the Mishmis said was that of a wild Mithan; the horns of this specimen were longer and more curved than those of the tame cattle and the skull was evidently that of a Gaur. This had been killed by a native hunter in the plains at the foot of the Mishmi hills. The skin and skull of the animal in the photograph have been given to the Society.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



The animal measured 85 inches from nose to base of tail and was 55 inches high. The horns are 16 inches in length, 14½ inches in circumference and 30½ inches between the tips.

F. M. BAILEY, CAPT.

ALIGARH, *March* 1912.

No. X.—TSINE (*BIBOS SONDAICUS*) FOUND WITH VILLAGE CATTLE.

The following may be of interest:—Last dry weather at the village of Kyaung-lé in the Kathir district of Upper Burma, a bull Tsine (*Bibos sondaicus*) came down alone and associated with the village cattle which were grazing in the reaped paddy fields adjoining the village. He remained there for all the dry weather apparently doing nothing beyond herding the cattle, as if by chance any of them showed signs of straying away he rounded them up and then settled down again exactly as a sheep dog would do. He apparently became quite domesticated paying no attention to the villagers looking after their cattle; in fact, Mr. Adamson, the Sub-Divisional Officer, Banmauk, was able to take a photograph of him at about

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

40 yards. So far the villagers assert he made no attempt to have connection with the village cows and at the end of the hot weather he retired into the jungle and was not seen again till last December when he reappeared among the cattle and resumed his former habits. About a fortnight ago, however, he was noticed to be paying particular attention to a young cow that had not yet been crossed, and after a few days he disappeared with her into the jungle and neither of them has been seen since. It remains to be seen whether either will return but they probably will and the result if any will be very interesting. I am glad to say strict orders have been issued that the Tsine is not to be shot or interfered with in any way. It is not an old bull and it is strange why it should have taken to this solitary life. Can it be that it has been driven out of the herds by an older and stronger bull and so forced to come to the village cattle for companionship? Considering the usual timidity and wariness of Tsine it seems extraordinary.

T. A. HAUXWELL,
Conservator of Forests, Burma.

BANMAUK, 26*th February* 1912.

No. XI.—NOTES ON BIRDS FROM LAHORE.

On April 30th, 1911, I saw a pair of Sparrows building in a Baya's (*Ploceus baya*) old nest in a Keekur tree. Thinking it unusual I put my glasses on them and found they were a pair of Rufous-backed Sparrows (*Passer pyrrhonotus*). On May 12th I looked them up again. Seeing both birds in the tree I climbed up and found they had four eggs of the finely freckled type. Incubation was advanced. I shot both birds to put the matter beyond doubt.

Again on August 6th, 1911, I saw a pair of this Sparrow building in another Baya's nest. On revisiting this locality I was sorry to see the egg chamber had been torn open from the exterior and no Sparrows to be seen. The curious part of this was that all the remaining Baya's nests had been treated in the same way! What could have done it? I thought the foregoing might interest some of the readers of the Journal as I see no mention of a similar occurrence in "Nests and Eggs" nor the "Fauna of British India" Birds. In May and June I saw many nests of the Golden Oriole (*Oriolus kundoo*) and with but few exceptions there was a nest of the Black Drongo (*Dicrurus ater*) in the same tree, in some cases on the same branch. Is this instinct or reason? Surely the Orioles know the great protection they obtain from the presence of the King Crows. On October 27th while taking a stroll near the Ravi, I heard a familiar note and on going up to the sound was pleased to see a Grey-headed Flycatcher

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(*C. ceylonensis*) a bird I know well in the hills around Simla. In the "Fauna of British India" it is stated :—*Culicicapa ceylonensis*. Distribution. "The whole Empire, except Sind, the Punjab and Rajputana, from which provinces I have not seen any specimens."

A. E. JONES.

LAHORE, 14*th December* 1911.

[Major Magrath found this Flycatcher a fairly common winter visitor at Bannu and obtained one specimen as early as October.—J., B. N. H. S., Vol. XX, p. 777.—EDS.]

No. XII.—NESTLING PLUMAGE OF THE GREAT STONE PLOVER (*ESACUS RECURVIROSTRIS.*)

As I can find no record of the down stage of *Esacus recurvirostris* the following description may be worth noting. On the evening of April 14th, 1910, I found a clutch of two eggs of this species in the bed of the River Sutlej at Phillour, which were chipped. These I took, and with my aid both young birds hatched the following morning. They were described on the 16th as follows :—

Upper parts ashy grey, tinged with sandy, much of the down with black tips. A black line divides the forehead and crown extending to the anterior corners of the eyes, and curving downwards over the cheeks to the ear coverts, nearly meeting black lines, which start from the posterior corners of the eyes and almost join on the occiput. The eye lids are fringed with grey down, the lower bearing a single black spot. An indistinct and broken black line crosses the upper back and extends along the upper portion of the flanks to the tail. There are indistinct black spots on the back. Wing ashy grey but without the black tips to the down, the anterior edge of the forearm darker, a black spot at the inner angle of the elbow. Lower parts greyish white.

Bill, short and stout, culmen curved ; dusky black, naval pits lighter. Eggtooth whitish. It is lightish brown. Feet plumbeous grey.

Call, a shrill chirrup, rather similar to that of a young sparrow.

H. WHISTLER, INDIAN POLICE.

RAWAL PINDI, *April* 1912.

No. XIII.—THE HIMALAYAN GREENFINCH (*HYPACANTHIS SPINOIDES*, Vigors.)

With reference to the discussion on this species started in the Journal [Vol. XX, p. 517] by Mr. Dodsworth, the following facts may be worth bringing to your notice. Col. Rattray in his article on "Birds nesting in the Murree Hills" in Vol. XVI of the Journal, p. 658, states :—"These birds

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

arrive suddenly at Murree about the middle of June and at once set about building, 3rd July was the earliest date on which I got eggs." Last year (1911) I had to spend a couple of days in May at the Police Rest House of Kotli, which is situated at about 5,400 feet in the hills south-east of Murree, overlooking the River Jhelum. While I was there I frequently noticed a flock of these birds in the neighbourhood of the bungalow and shot a couple [Skin Register Nos. 373 & 374, Kotli, 26th May 1911], which proved to be young birds that had only recently left the nest. The flock contained 15—20 birds.

These facts tend to show that after breeding early at a low elevation, the birds migrate for a second brood at higher levels, a theory that should easily be disposed off one way or the other.

H. WHISTLER,
INDIAN POLICE.

RAWAL PINDI, *April* 1912.

No. XIV.—DISTRIBUTION, HABITS, AND NESTING OF THE HIMALAYAN GREENFINCH (*HYPACANTHIS SPINOIDES*, Vigors.)

A few years ago, when I first began to take an interest in this pretty little Greenfinch, I noticed that in the neighbourhood of Simla and adjacent ranges, it became tolerably common from about June (earliest date on which seen here up to this 4th June), to the end of October, and then seemed to disappear. Thinking that it was probably subject to a seasonal movement along these ranges, like some other hill birds, I consulted various books and papers on Ornithology, to which I had access, but found no mention of this, and yet I was certain that this species was not a permanent resident here.

In order, therefore, to clear up all doubts I made an enquiry (J. B. N. H. S. Vol. XX, p. 517) as to whether this bird was a permanent resident at moderate elevations. In addition to the replies received to this, and which are recorded in the Journal (*vide* Vol. XX, pp. 852 and 1152, and Vol. XXI, p. 262), I received the following from Mr. E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.

"The bird breeds at Darjeeling at elevations between 8,000 and 10,000 feet, and perhaps as low as 7,000 feet. Like most hill-birds, it moves up and down with the varying seasons, higher in the hot weather, and lower as it gets colder. I do not think one could call them migratory."

In view of the observations referred to above, I think there can no longer be any doubt as to this species being subject to a seasonal movement along these ranges, and it would, therefore, be more correct to give its distribution as follows: Common from about May or June to October along the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Himalayas at elevations of 6,000—10,000 feet, and, perhaps, even higher, from the south side of the Pir Panjal Pass in Kashmir (Brooks) to Sikkim (Blanford): also recorded from Manipur (Godwin-Austen). During the cold weather these birds move down to lower elevations, and the North-West Himalayan ones, at all events, are found in the Duns and plains (Bijnor to Pilibhit) at the foot of the mountains (Osmaston).

These Finches generally keep to the woody portions of the hills, and are gregarious, moving about in small flocks, except during the breeding season, when they pair off. They appear to be partial to certain localities in the station here, and are not to be seen in other parts of it at all. When once established at a particular spot, after their first arrival here, they frequent it with great regularity. The abundance of food supplies is doubtless the most important factor that influences selection, as they only come up here to breed: but it seems also essential for them that the hill-sides shall be fairly well wooded—those covered with Himalayan Cedars (*C. deodara*), and Blue Pines (*P. excelsa*), undoubtedly receiving the preference.

They are very fond of the ripe seeds of the sun-flower plant, and during their sojourn in Simla, these seem to constitute their chief diet. In order to secure these seeds, they visit the gardens and compounds here freely. When feeding, which is generally in the early mornings and afternoons, they are not at all shy, and allow one to approach quite close to them. The cocks, I have noticed, are gorgers; one will take up his position on a particular flower, have a few nips, then take a "breather," and start afresh. If by chance another cock happens to settle on the same flower, a battle usually ensues—both birds fighting in the air, and then quietly flying off in different directions. No twittering, as a rule of any kind, goes on among the birds while feeding, and their yellow and green plumage blends beautifully with the flowers; in fact to such an extent that at times it is difficult to catch sight of them even at close quarters.

Their flight is undulating and swift, and when passing across or overhead, it is not at all easy to catch sight of them, but their peculiar twittering, which is constantly uttered, betrays their movements.

There is some disagreement among ornithologists in regard to the notes of this bird. Adams states that its cry is very like that of the English Siskin, but Hume contradicts this and so does Brooks. The latter's description of its song is undoubtedly the best: he aptly likens it to the characteristic "beez" of a Greenfinch. This "beez," I may add, is only uttered by the cock, usually when perched on the topmost branch of a tree, and can be heard from a long distance off. The other note, which is also indulged in by the hen, is a soft twitter or "chick" constantly emitted, even when on the wing.

This Finch breeds in July and August, but the great majority of the birds lay in the last mentioned month. The earliest and latest dates on

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

which I have taken eggs are the 31st July (3 fresh eggs), and the 14th September (3 fresh eggs), respectively. I may, however, mention that on the 26th July of this year I found a nest containing four young ones, about a week old, and the eggs in this case must have been laid about the end of the first week of that month.

The highest altitude at which I have found these birds nesting is 7,000 feet, but by far the largest number breed at about 6,000 feet: I have never yet taken a nest below the latter elevation.

These Finches are gregarious in the strict sense, even to the extent of breeding in company, and it is curious that this point should have escaped the observations of Hume. I remember once finding no less than half a dozen nests within a radius of not more than 15 yards, and on another occasion, four nests within a radius of about 15 yards. I have several times found two nests quite close to each other, and once I took a couple of nests from the same tree. It is true that I have sometimes found isolated nests, but I consider this the exception, or, perhaps, what is more probable is that there were other nests close by which were not located. In connection with the gregarious habits of this bird, I extract the following *in extenso* from my daily Journal:—

21st August.—Took another nest containing five fresh eggs placed on a *P. excelsa*, about 25 feet distant from the tree, which contained the second nest mentioned above. In the latter case only two eggs were taken, but the clutch was probably not complete. My idea is that the bird to which these two eggs belonged, on finding her nest gone, forthwith went and deposited her remaining egg or eggs in to-day's nest. It is not unusual to find five eggs in a nest, but the above is corroborated to some extent by (*a*) our seeing *three* birds—two hens and a cock—hovering about in the vicinity, and judging from their anxious behaviour when the climber approached the nest, there seemed little doubt that it was a sort of "joint stock" concern, which belonged to them all, and (*b*) the fact that this nest a few days previously only contained three eggs: day before yesterday it still contained only three; to-day we were astonished at finding five!

I have never yet had the good fortune to witness the courtship of these birds, though I have frequently seen them *in copula*, after the manner of sparrows, near their nests. They pair off soon after their arrival here, and are shortly afterwards busily engrossed in domestic affairs.

They have only one brood annually, so far as Simla is concerned, and build a fresh nest each year: I have never known them ever to take possession of the nests of other birds, though on one occasion, I noticed a hen lining her nest with horse-hair taken from an old nest belonging to a Jungle Crow (*Corvus macrorhynchus*), which was close by.

I have already stated that these birds generally resort to hill-sides covered with Himalayan Cedars and Blue Pines, and these trees are *par*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

excellence the ones which are chosen for nesting: I have never yet found a nest on an oak, though Hume records having done so. According to him the Deodar, by which he apparently meant the Himalayan Cedar, *Cedrus deodara*, is the favourite. Out of a total number of 29 nests, which have come under observation during the last few years, I find that the results in regard to the selection of trees by these birds are as follows:—

Himalayan Cedars (*Cedrus deodara*)	16	nests.
Blue Pines (*Pinus excelsa*)	11	,,
Kharki trees (*Celtis australis?*)	2	,,

When a Himalayan Cedar has been chosen, the nest is invariably placed on the upper surface of one of the horizontal branches, generally towards the extremity; and in the case of a Blue Pine, in one of the uppermost forks or tufts. In the "Kharki" trees, the two nests were built on the outer ends of the branches, where they had been pollarded for the village cattle. They were all firmly attached to the boughs or twigs (in whichever of their positions they happened to be placed). *The* feature about these nests, however, is that no matter what their position may be, or on what trees they are placed, they are all without exception *well* hidden: in fact so admirably is concealment effected that, if not discovered during the process of construction, it would be almost impossible to find them afterwards. Every advantage is taken by the birds of a thick tuft, or bunch, or cluster of leaves under which to build their nests, and I am firmly convinced that these elaborate precautions are taken, not only as a safeguard against possible enemies, but also as a *protection against the heavy showers of rain*, which we usually have in these parts in August, and this is the month during which most of these birds lay. I have frequently made a point of examining the tenanted nests after very heavy showers of rain, and have always found them to be absolutely dry—a marked contrast to some of the nests of *T. lineatum*, which are still to be found at this time, and which are usually wet and damp. Another point worth mentioning is that a large number of finished nests are deserted, and this, I think, is due to their not being found sufficiently water-tight on completion. What adds colour to my supposition is that, on examining these deserted nests, I have always found them to be soaked with water. As illustrating how well these nests are concealed, I give below the substance of a note from my daily Journal.

About the beginning of the second week of August, one of my hunters found a nest of this bird being built. He visited the tree two or three times, and after allowing sufficient time for the full complement of eggs to be laid, I accompanied him to the spot early in the morning to take them, but on examining the branch the man reported that the nest and eggs had disappeared! I could hardly credit this, as the nest had been inspected only the evening before and it then contained three eggs. Before leaving the spot, I told the man, as a last hope, to break the leaves from the branch,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

near the spot where the nest had been, and to make a further careful search, and on his doing so, he found the nest and eggs. And yet the whole time, he had been standing on the branch not more than half a dozen inches away from the nest!

The nest takes about a week or nine days to complete, and the hen alone, in addition to carrying the materials, is the sole architect. The cock follows her about but gives her no help whatever. The time when the hen is most active in carrying materials, while building is progressing, is from early in the morning to about 10 or 11 A. M., and this is *the* time to locate a nest. Between 11 A. M. and 3 P. M. occasional trips are made to the nest, and then only after long intervals. After 3 P. M. building operations cease for the day. A great deal of twittering goes on while the hen is in the nest, and when the latter is nearing completion, the birds are frequently to be seen pairing near it.

The nests are compact, neat, cup-shaped structures, composed chiefly of stalks and roots of grass and small plants, and other such like materials (one only of my nests has a thin coating of moss—Hume says that there is *much* moss blended with the exterior), and lined interiorly with very fine grass-roots, thin fibres resembling coir, horse-hairs, and a few feathers, and occasionally bits of cotton. The dimensions of 12 nests agree generally with those given by Hume.

The heights of the nests varied from 6 to 65 feet, but the average height of 29 nests was 30 feet.

In some cases I noticed that the birds commenced laying immediately the nests were completed; while in others, a short period elapsed.

The number of eggs varied from 3 to 5, but the normal complement is 4. The largest number of young ones found in a nest was 4, and the smallest number of well incubated eggs was also 4.

The eggs are laid one daily, and the hen usually begins to brood after the second egg has been laid.

The hen alone performs the labours of incubation, and while sitting in the nest is fed by the cock. The young are hatched in 13 days, and both birds help in feeding them. They leave the nest in about a fortnight, and follow their parents about for some time, and are fed by them.

The eggs of this bird are excessively delicate looking and pretty. The colouration of both unblown and blown eggs is generally as described by Hume, but there are some slight differences, which become apparent, in a large series. I have before me at present 46 specimens, which exhibit the following variations as compared with Hume's account.

"The eggs when fresh are a delicate, slightly *greenish*-white," usually with an irregular ring, and occasionally with an irregular *cap* of minute blackish-brown spots round the large end, and the *majority* have a few similar specks scattered here and there over the body. In addition to the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

blackish-brown spots forming the irregular rings or caps, some specimens have specks of various shades of reddish-purple.

After a very short time the blown specimens unfortunately change colour, and the ground colour becomes "a very delicate pale sea-green," but the blackish-brown and reddish-purple specks remain unchanged.

With reference to fresh eggs, I take this opportunity of mentioning that when blowing the specimens, great care should be exercised, as the spots are liable to run.

The general shape of the eggs is an oval, a good deal pointed towards the small end; but a few (and these are rare) are somewhat elongated, with blunt ends. One or two of my specimens, apparently deformities, are almost eliptical in shape.

In size they varied from ·67″ to ·68″ in length, and from ·52″ to ·58″ in breadth; but the average of 46 specimens measured was ·73″ × ·55″. The average weight of 25 fresh eggs was 29·94 grains.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 12*th June* 1912.

No. XV.—THE LONG-TAILED GRASS WARBLER (*LATICILLA BURNESI*, Blyth.)

The distribution of this species is given in the Fauna [Vol. II, p. 380,] as "Upper Sind from the junction of the Chenab and Indus rivers to Larkhana, and also on the Eastern Nara, where Doig found this species breeding. Jerdon records it from Monghyr on the Ganges in March."

Hence I was somewhat surprised to find that this curious little bird is a very common resident in the grass jungles that border the River Sutlej on its passage through Ferozepore District.

They are to be met with both in pairs and in small parties and habitually frequent the lower portions of tufts of grass which they tread in a mouse-like manner, but before entering the tuft they usually perch on an outer stem for a few seconds, which renders the task of securing specimens fairly easy. The song is short but quite sweet, and in addition they have several scolding notes with which to greet the intruders.

I failed to secure eggs, but on April 8th found a nest containing 3 half-fledged young. This nest was large for the size of the bird, cup-shaped, and placed low in a grass tangle, growing round some dwarf tamarisk. It was made of grass and grass down, the latter being welded into a somewhat felt-like lining. Two similar nests were found and attributed to this species, but they had obviously been used and left. The nests are very difficult to find.

On occasion these little warblers can be confiding enough. One evening I was lying in a thick patch of jungle at the edge of the river watching a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

gaggle of barheaded geese when one *Laticilla* came and ate something on the ground within a yard of my face.

H. WHISTLER,
INDIAN POLICE.

RAWAL PINDI, *April* 1912.

No. XVI.—NIDIFICATION OF BURMESE GREAT BLACK WOODPECKER (*THRIPONAX FEDDENI.*)

To-day (February 6th) I have obtained the eggs of this species from a tree close to my present camp, about 15 miles east of Thayetmyo.

Yesterday one of my elephant attendants reported to me he had found the nest-hole, and that the bird, a black and white woodpecker, had flown out and that he had felt the eggs. I was rather doubtful as to the truth of his statement, but the same afternoon proceeded with him to inspect. He took me to a "Letphan" tree standing in an old clearing, all around being "Kanig" grass interspersed with a few tall trees. Locality close to banks of a broad creek. I saw the nest-hole at once, and as we were talking the bird flew out, an undoubted specimen of the Burmese Great Black Woodpecker. I did not shoot it, although it offered many opportunities, as it kept flying from tree to tree close at hand, uttering its rancous call, because I was not yet certain whether the hole contained eggs.

The Letphan tree in which the hole was made, was about 2 feet in circumference, the hole was situated about 14 feet up the hole and lying at foot of tree there was a small heap of soft wood chips of the Woodpecker's excavating. Had it not been for the thorny spikes with which the stem was covered, the tree presented no difficulties in climbing. These spikes, however, we knocked off with a stick, and I swarmed up, but was disappointed to find I could not reach the bottom of the hole, as the entrance was too small to allow of more than the half of my forearm to pass through. The attendant with me could do no better. I then questioned him as to why he had told me that four days previously he had felt eggs, and he told me that at that time the hole was not so deep.

To-day I sent one of my servants, a small boy, whose arm would be likely to pass through the hole to feel in the nest for eggs, but alas quite contrary to my orders. Not only did he feel, but he took the two eggs and brought them back to me. Had I known there were eggs, I would have had them taken in my presence, and at the same time shot the parent bird.

The eggs are pure white, very glossy with a certain amount of transparency, and are fragile, considering their size. They measure 1·35 × 1·0.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Apparently the nest-hole was 1 foot deep, and as far as I could feel, almost the whole of the small tree had been hollowed out, and only a thin surrounding wall about 2″ in width being left.

The interesting point is, the bird, if my man's story is true, continued excavating after the eggs had been laid. Is this a usual practice with Woodpeckers I wonder? If so, it may be that the birds continue to excavate, as incubation of eggs progresses, in order to have a sufficiently large enough chamber prepared to receive the young.

The incubation of eggs I took had well set in, and in another 5 days would have been impossible to blow.

J. P. COOK.

CAMP, 6th *February* 1912.

No. XVII.—A KITE'S LARDER.

Yesterday I saw here a common Pariah kite (*Milvus govinda*) sitting on the edge of what appeared to be a large nest built in an Indian cork tree (*Millingtonia hortensis*), and as it refused to move, although several stones were thrown at it, I climbed the tree to see if the nest contained any eggs.

To my surprise I found that the nest contained no eggs, but a regular larder containing several dead squirrels, parroquets, crows and some old bones, all in various stages of decomposition, showing that the bodies had been placed there at various times. We had been shooting squirrels and parrots, etc., lately, as they had been a nuisance.

The nest appeared to belong to three kites, all of whom appeared to be adult birds, and all of whom came to the nest at various times to feed.

Is it a common practice amongst these birds to make a larder?

G. L. REMINGTON.

BANDIKUI, RAJPUTANA, 18*th February* 1912.

No. XVIII.—OCCURRENCE OF THE COMMON PEAFOWL (*PAVO CRISTATUS*, Linn) IN THE NEIGHBOURHOOD OF SIMLA, N.-W. HIMALAYAS.

The Common Peafowl (*P. cristatus*) has generally been supposed not to be a bird of high elevations, but this is hardly correct so far as these parts are concerned. It is common in the Ghana-ka-hati Jungles, (elevation about 5,500 feet), in the Dhami State, which are reserved for His Excellency the Viceroy, and which are not distant more than seven miles from Simla. Again it is found in considerable numbers below the cart-road in Patiala territory, about 8 or 9 miles from Simla, and at about an elevation of 5,000 feet. Lastly a pair of these birds, which were

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

doubtless stragglers, were seen on the 25th April 1912, on the Kalka-Simla Railway line, a little beyond the Tara Devi Station (elevation 6,050 feet).

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 30*th April* 1912.

No. XIX.—SWINHOE'S SNIPE (*GALLINAGO MEGALA*) NEAR MADRAS.

I am sending you by registered parcel a specimen of Swinhoe's Snipe (*G. megala*) which I shot on 3rd March at Tindivanam some 75 miles south of Madras. I regret it is somewhat damaged. The specimen was skinned for me at the Madras Museum, and the measurement are those made by the Museum. The bird was only recognized on examining the bag on the homeward journey.

MADRAS, 20*th April* 1912. R. F. STONEY.

There were several specimens of this snipe shot in Madras this season, all in the Chingleput district. Mr. R. F. Stoney had two, my partner Mr. Graham Ross shot one, and I had three.

I am afraid my partner and I would have passed them over as Pintails, had we not known that Mr. Stoney shot one early in the season.

I. S. FRASER.

MADRAS, 26*th April* 1912.

No. XX.—CRUELTY TO WILD FOWL, &c., IN SIND.

While shooting in Manchar Lake during January and February, I have noticed the following cases of cruelty to wild fowl, &c., and should like to bring them to the notice of the Society:—

(*a*) *Egrets.*—These birds are caught and blinded, in order to prevent them escaping. Each bird I am informed yields about Rs. 6 worth of feathers, per annum.

(*b*) *Herons* are similarly blinded, kept in captivity, and used as decoys.

(*c*) *Duck, Geese, Coots, &c.*—A net ¼ to ½ mile long and about 7 feet high from the water is put out in a likely place. At night, men in boats approach the birds feeding near by and without putting them up drive them slowly in towards the nets; when near enough, lighted torches are thrown at the birds and thus suddenly alarmed they fly off low along the water and get entangled in the nets. The owners then take them out, *break their wings and very often their legs as well* to prevent them escaping and in this state keep them alive for days. My Shikari informs me that a good many are sent to Karachi for sale there.

Any day one can see four or five nets up and I believe that in a successful drive as many as two to three hundred birds are obtained.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Fishing by means of nets, night lines, spearing, &c., is carried on all the year through, no close season being apparently enforced.

C. H. ELLIOT, CAPT.,
58th Rifles, F. F.

QUETTA, BALUCHISTAN,
11*th February* 1912.

[Major Magrath has already drawn attention in this journal and other papers to this abominable practice of maiming wild fowl in the Punjab. The Commissioner in Sind has informed us that he is making full inquiries with a view to such action as may be practicable.—EDS.]

No. XXI.—THE HIMALAYAN SNOW COCK (*TETROGALLUS HIMALAYENSIS*).

I send a photograph of the Himalayan Snow Cock, 'Ramchukor,' taken by me.

These birds were caught when quite young and now are free to roam about the garden and are very tame, as they will feed out of my hand when I whistle their call to them. Their plumage just at present is in its most perfect state, the heavy chess board game marking is very pronounced, the collar and ruff below the bill on the neck stands out very strongly as you can almost see the photograph. They are as heavy as a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

good home capon. They are terrible gardeners; bulbs have no chance at all and any root they think good to eat is speedily dug up and demolished. I am sorry to say they are all female birds. The only cock was damaged by a fox and had to be put out of his misery. They spend a good deal of their time, especially in the evening, on the roof of the house and call splendidly, often about the same time as the Moslem Mullahs call to evening devotion. This certainly is the habit of these birds, to group in the evening on their mountain resorts, before they climb up into cliffs for the night. Eagles, and in the summer months foxes, are their deadliest foes. They are not easy to shoot, as they are wary to a marvellous extent, and their feeding grounds are pretty much the same as the Markhor and Ibex, and one rarely sees them therefore except when stalking the two latter lords of the mountains, and a shot gun has no place then.

W. G. APPLEFORD.

GILGIT, KASHMIR,
29*th January* 1912.

No. XXII.—WOODCOCK (*SCOLOPAX RUSTICULA*) IN SOUTH ANDAMANS.

I saw a Woodcock near the town of Aberdeen, South Andaman, on the 26th January. I send you a note of the occurrence as I do not remember to have heard of the woodcock being reported as yet from these Islands.

J. H. WHITEHEAD, MAJOR,
93rd Burma Infantry.

PORT BLAIR, ANDAMAN ISLANDS.
3*rd February* 1912.

No. XXIII.—NOTE ON THE HABITS OF SWINHOE'S REED-WARBLER (*UROSPHENA SQUAMICEPS*) AND ON THE NESTING OF THE BURMESE GREAT WOODPECKER (*THRIPONAX FEDDENI*).

I posted to you yesterday a box containing skins of (1) Swinhoe's Reed-Warbler (*Urosphena squamiceps*) and (2) Tweeddale's Scimitar Babbler (*Pomotorhinus nuchalis*).

Of the former bird Oates writes in the "Fauna of British India" (Birds, Vol. I): "This rare Warbler has been once procured at Bankasun in the South of Tennasserim, by Davidson * * * * * Nothing is known of its habits."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I found this bird comparatively common in the tract I have been touring in lately, *viz.*, the forests on the Eastern slopes of the Pegu Yonas or range dividing Sittang from Irrawady rivers situated about 60 miles due east of Thayetmyo.

The date of first bird seen was January 26th, the last occasion on which I noticed one, being March 12th. Between these dates I saw many birds and had good opportunities of watching their habits. They frequent the edges of densely forested streams, but one more partial to those parts where kaing grass grows. They feed mostly on the ground creeping about amongst the leaves in the thickest of scrub, but occasionally coming out into the sandy creeks hunting for insects amongst the drift-wood. I found one bird I shot had been feeding on very small black beetles found in the sand.

I only found the birds singly and they are hard to discover, until they make their presence known by their note, a soft low 'chip' 'chip,' this note being almost invariably uttered on being disturbed. They are by no means shy birds and not until they are approached very closely do they fly, or rather flit to some other bit of thick scrub.

I have been fortunate in obtaining for our Museum one good specimen, as it is very difficult to procure the birds without very much damaging the skins, as owing to their skulking habits, they have to be shot at a very close range and out of seven birds shot I only procured 4 specimens worth preserving.

Tweeddale's Scimitar Babbler (*nuchalis*) is a very common bird in the Pegu Yoma forests, but I thought our Museum would be glad to receive a specimen.

Great Black Woodpecker (*Thriponax feddeni*).—I have already reported the taking of this bird's eggs on February 6th. On the 18th of same month, I noticed another bird of the same species excavating its nest hole. I watched its nest and on March 1st took from it two fresh eggs.

Thriponax feddeni appears to be an early breeder and somewhat irregular, as just about the same date as I found the bird excavating its nest hole, my men found another nest of almost fully fledged young, the date being about February 17.

THAYETMYO, *March 26th*, 1912. J. P. COOK.

[We are very glad to receive these skins which are new to our collection.—EDS.]

No. XXIV.—CHINESE GREY DUCK IN BURMA.

From the Rangoon Gazette, dated 16th January 1912.

I have great satisfaction in recording what I believe to be the first authentic record of the Chinese Grey Duck (*Anas zonorhyncha*) in Burma.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

During our Christmas shoot at Tongyi, Mr. D. H. M. Boyle on 26th December was lucky enough to shoot one of a pair (female) of the above species. In the flesh the difference between it and the common Burmese Grey were most noticeable, and on comparison with a hen of that species the following points were noted.

Chinese Grey Duck (female).—Wing much more pointed, the 1st and 2nd quills being of the same length, 3rd ¼ inch shorter than 2nd, 4th ¾ inch shorter than 3rd, 5th ½ inch shorter than 4th. The two conspicuous black shields (which are red in the true spotted-billed Duck) absent, their place being entirely covered with feather. The yellow patch at the end of the bill much narrower. The underwing coverts (inside wing) pure white. Breast and under parts tinged with rust colour, and boldly streaked with blackish brown, and not conspicuously spotted as in the Burmese Grey Duck. *Speculum*—Consisting of firstly, a very narrow irregular greyish white line, followed by a black one, both the above bars on the feathers immediately above a wide dark greenish blue band, below this another black band, some of the feathers narrowly edged with white. The outer edge of only one long secondary wing feather edged with white. In fact very little white in the wing when compared to the Burmese species. When fresh the coloured bar in the wing was a decided blue with a green tinge. It has now faded to a dull green. Legs much paler, in colour and not a bright red.

Burmese Grey Duck (female).—Wing rounded, and quill ¼ inch longer than 1st, 3rd equal to 1st, 4th quill ½ inch shorter than 3rd, 5th quill ½ inch shorter than 4th. The underwing coverts tinged with grey at their extremes. At base of the bill two conspicuous black shields. Breast and underparts spotted with round blackish-brown spots. *Speculum*—Firstly, a band about half an inch white, then a narrow black band. Then a broad dark green band followed by a black band, feathers below edged with white. The outer edge of *three* of the long secondaries edged with white. The green on the speculum being wider than in the Chinese Duck being on ten feathers while in that species it is on only eight feathers.

Burmese Grey Duck.—It may be as well to point out the differences between the sexes. The male, besides being larger in size, has the rump and tail coverts both above and below black glossed with green, the female dark-brown only. The male has more white on the secondaries, and breast more boldly spotted with black. Occasionally in old males the bright red feet edged with black.

I give below a list of the bags made at Tongyi, Tankobin, and Nawngmun (Shwepi) this last Christmas week, made by three different parties. Also the bags of Christmas shoots in 1895, 1896, kindly given me by Major W. H. Whitehead and Mr. E. Gabbett.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Tongyi.	Nawngmun.	Tankobin.	Shwepi, 1895.	Shwepi, 1896.
Grey-lag Goose, *Anser rubrirostris*	25	34	13	23	46
Bar-head Goose, *Anser indicus*	....	..	..	1	..
Brahminy Duck, *Casarca rutila*	4	2	5	6	..
Nukhtas, *Sarcidiornis melanonota*	....	..	2	1	..
Burmese Grey Duck, *Anas haringtoni*	35	4	3	9	10
Chinese Grey Duck, *Anas zonorhyncha*	1	..	..	..	..
Pin-tail Duck, *Dafila acuta*	18	9	6	41	39
Gadwall, *Chaulelasmus streperus*	1	..	..	41	20
Widgeon, *Mareca penelope*	1	..	..	4	4
Shoveller, *Spatula clypeata*	1	1	..	34	35
Tufted Duck, *Fuligula fuligula*	19	64	24	53	122
Common Pochard, *Nyroca ferina*	....	..	..	..	3
White-eyed Pochard, *Nyroca africana*	3	..	..	18	20
Common Teal, *Nettion crecca*	36	10	32	52	41
Garganey Teal, *Querquedula circia*	22	..	16	23	142
Cotton Teal, *Nettapus coromandelianus*	....	..	1	0	29
Whistling Teal, *Dendrocyena javanica*	....	..	..	2	51

Note.—Burmese Grey-Duck.—Of the 35 shot at Tongyi, 3 showed slight traces of red on the bill evidently due to "spot-bill" blood and one each at Nawngmun and Tankobin, in none were the spots perfect.

White-eyed Pochard.—Major Whitehead says in 1895-96 he did not know the difference between the Eastern and Western birds, and some may have been the Eastern white-eye (*N. baeri*).

Whistling Teal.—Major Whitehead also says no account was kept of these whether they were the larger or smaller species.

Grey-lag.—Several shot this year, had the nail at the end of the bill dark horn colour instead of whitish. I could however see no other difference between them and the other grey-geese shot at the same time. This year there was a great deal of water about and birds not all plentiful. In Mr. Gabbett's note for 1896, he says very little water and birds plentiful.

H. H. HARINGTON, MAJOR.

XXV.—NIDIFICATION OF DAVISON'S BABBLER (*TURDINULUS EXSUL*).

During a recent visit to Mandaung (Toungoo Hills), I found the nest of Davisons's Babbler, *Turdinulus exsul* (186*a*). At least I think it must be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

this bird I shot off the nest. It is the same as is referred to on page 670 of the last number of the Journal as *Turdinulus roberti*. I will, in the meantime, describe the nest. It was in a screw-pine on a pad of dead bamboo leaves. From the pad other dead bamboo leaves seemed to have been made to stand up bound round with other leaves. The height from the pad was 6-inch ending in a dome. Entrance at side and very large for so small a bird. Below bottom of entrance was a hollow cup of fine grass. The whole like a shelter chair one sees at the seaside. The date was the ninth of April. Three eggs, pure white not smooth nor glossy, in shape a pegtop. One broken on nest. One my man broke. All very hard set. I gave the third to ants to clean, but they so discoloured it and ate the opening that I had to throw it away. Unfortunately I had not measured them.

RANGOON, 14*th May* 1912. S. M. ROBINSON.

No. XXVI.—THE SHELDRAKE (*TADORNA CORNUTA*) IN THE UNITED PROVINCES.

In November I shot a pair of Sheldrake in the Sitapur District, U. P., near the Ghogra river. I understand that these birds are very rare in this part of India.

MUSSOORIE, 20*th April* 1912. F. B. SCOTT.

No. XXVII.—NOTES ON SOME BIRDS FROM THE CHINDWIN VALLEY.

The following may perhaps prove of interest, as I do not think any of the birds enumerated have previously been recorded from the Chindwin.

1411. *Anthropoides virgo*—Demoiselle Crane. I saw and fired at a pair of these birds on a sand bank about 40 miles above Kindat on December 28th, 1911. As I had them under observation with a powerful glass for at least 10 minutes before firing, there can be no possible mistake. In view of our scanty knowledge of the Cranes of Upper Burma, it may be worth recording that Mr. Dove, Executive Engineer, tells me that when engaged on road work on the Chinese Frontier, near Bhamo, he frequently saw and several times shot Demoiselle Cranes. As I also recorded this species from Aracan, it is probable that the birds are fairly frequent visitors, at all events to Northern Burma.

1491. *Larus brunneicephalus*—Brown-headed Gull. On New Year's Day, 1912, I saw a single gull flying along the Chindwin river, not far from Monywa. I could not identify the bird with certainty, but have little doubt it belonged to this species, with which I was well acquainted in Aracan.

1609. *Fuligula fuligula*—Tufted Duck. I shot a male, one of a small flock, on January 5th, 1912, on a jheel about 30 miles south of Monywa.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1207. *Hieraëtus fasciatus.*—Bonelli's Eagle. On January 7th, 1912, when duck shooting, I found an eagle's nest on a cotton tree. On sending a man up, a large eagle, of a species unknown to me, flew off the nest and the climber reporting two eggs, I pursued and shot the eagle, which proved to be a fine female of the abovenamed species. The bird measured length 29·5 : tail 11 : wing 20·5 : tarsus nearly 4. The eggs, dirty white, faintly blotched at the large end with pale yellowish brown, measuring 2·64 × 2·2 and 2·72 × 2·2.

1255. *Falco peregrinator*—Shahin Falcon. On April 15th, 1911, I saw a falcon go into a cleft in a sandstone cliff on the river bank, about 60 miles above Monywa. The cliff was of no great height, and by letting a rope down from above, a man easily climbed up to the nest. He reported three young birds which I left, in the hope that the birds would breed again this year. Yesterday, March 7th, 1912, I again visited the spot and had the pleasure of taking from the same hole two beautiful eggs which proved to be about half set. With some compunction, I shot the male bird, which arrived with a parrot (*P. torquatus*) in his claws. Whilst the nest was being robbed, the female flew round screaming (she did the same last year); but made no attempt to attack the man, and she returned to the nest-hole as soon as we left. I much regretted shooting the male, as it turned out that my identification was correct, and his death was therefore unnecessary; but as these falcons are by no means uncommon, I have considerable hopes that the female may find another mate, and that more eggs may be forthcoming. There was no attempt at nest, the eggs being deposited on the bare earth. They are much more richly marked than the one described by Hume: the ground colour is pinkish, densely freckled all over with minute specks, and sparingly blotched at the small end with small spots varying in colour from rusty to sepia, the latter being less numerous than the former. The spots increase in size towards the large end, where they coalesce to form a rust-coloured cap speckled with sepia. The eggs measure about 2·1 × 1·5.

1553. *Anastomus oscitans*—The Open-Bill. I have just noticed that this bird is put down by Blanford as being unknown in Burma except in Aracan and Pegu. As a matter of fact, it is common enough on the jheels of the Lower Chindwin, though I do not recollect seeing it in the Upper Chindwin.

CYRIL HOPWOOD,
D. C. Forests.

MONYWA, U. BURMA, 17*th March* 1912.

No. XXVIII.—BAIKAL OR CLUCKING TEAL (*NETTION FORMOSUM*) SHOT IN ASSAM.

I am sending the Society the skin of a Baikal or Clucking Teal which was shot near Sibsagar, Assam, in January or February 1910 by Mr. Morton Eden.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mr. Eden had no idea that he had shot a Baikal Teal till he had gathered the duck shot, some 40 or 50. It was apparently amongst a flock of Common Teal.

Most of our shooting is done in the fog starting at daybreak, as when the fog lifts, all good ducks go off towards the Brahmapootra. It would not be an easy matter to recognize birds under these circumstances; you hear the rush of wings and it takes you all your time to mark where they are coming from, and if you are not very quick they pass before you realize this.

DEKHARI TEA CO. DEOHALL DIVN., ASSAM, *February* 1912. FRANCIS W. GORE.

Mr. Harrison has written to me with reference to a Clucking Teal *(Nettion formosum)* he shot near Lainekusi as follows:—"On the 24th of February last, in company with Mr. R. S. Pearson, Forest Economist, Dehra Dun, I visited a Bhil close by here to look for duck, a flock of Gadwall *(Chaulelasmus streperus)* got up and flew over Mr. Pearson; one solitary Teal flew in my direction which I shot. We both decided that it was an uncommon specimen. The bird made no sound at all and flew like a Common Teal."

DIBRUGARH, 3*rd May* 1912. EVAN A. EVANS.

No. XXIX.—INSECTS IN THE NESTS OF THE COMMON SWIFT (*CYPSELUS AFFINIS*).

On examining the nests of these Swifts I noticed that some of them swarmed with insects, which I thought were parasites of these birds. The Hon'ble N. C. Rothschild has recently identified these insects as beetles belonging to two species of Dermestidæ; the one being *Anthremus fasciatus*, Hbst., and the other an *Attagenus*. This gentleman adds *in epist*:—"I do not think that the specimens in question are really parasites of the Swift; in fact, I feel sure, they are not, but the larvæ feed on old feathers and similar refuse, which explains their presence."

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 30*th April* 1912.

No. XXX.—DISTRIBUTION OF THE CRICKET *SCHIZODACTYLUS MONSTRUOSUS*.

It may be of interest to note in regard to the distribution of *Schizodactylus monstruosus*, I have frequently found this curious cricket whilst digging in sandy soil in the vicinity of Campbellpur aud Nowshera. It would seem, therefore, that it has a much wider distribution than given by Lefroy in his "Insect Life in India." Natives have assured me that this insect feeds on flesh.

MULTAN, 16*th March* 1912. W. P. C. TENISON, LIEUT., R.F.A.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXXI.—INTELLIGENCE OF ANTS.

Last year I kept some colonies of ants in glass nests, as recommended by Lord Avebury. One evening I placed some golden syrup near a nest. In the morning, instead of the clear syrup, I found a thick black paste. I took this away and put a fresh supply of syrup. One or two ants came and felt it with their antennæ, and then went off and returned with dry grains of dust, bits of stick, etc., and placed them on the edge of the syrup. After a short time the edge of the syrup became firm enough for the ants to mount on it without sticking, and so they gradually converted the whole into a stiff paste. They then moulded the paste into little balls with their jaws and antennæ and thus carried it into their nest.

MUSSOORIE, 20*th April* 1912. F. B. SCOTT.

No. XXXII.—THE CASTOR RUST (? *MELAMPSORELLA RICINI*, De Toni).

With plates A & B.

* The rust on Castor was first described about the year 1815 by A. de Bivona-Bernardi as *Uredo ricini* occurring in Sicily. Later on it was described as *Cæoma ricini* by Von Schlechtendahl in "Fungorum novorum et descriptorum Illustratione publicat" in Linnæa, Vol. I, p. 612, 1826, the *Uredosori* being apparently taken for *Aecidia* of the *Cæoma* type. In 1878 again it was named *Melampsora ricini* (Biv-Bern) Pass. by G. Passerini in Baglietto F. de Cesati V. and de Notaris G. "Erbario crittogamico Italiano" Ser. II, Fasc. XIV, No. 684. The name was yet again changed by de Toni in Saccardo's Sylloge, Vol. VII, p. 596, to *Melampsorella ricini*. It is still doubtfully referred to the genus *Melampsorella*, presumably on account of the similarity of its Uredo stage to that of *Melampsorella caryophyllacearum* (D. C.) Schroet.

I am indebted to Dr. Butler, Pusa, for letting me see a specimen with description and figure from Briosi and Cavara's "Funghi parasite delle piante coltivate," fase XV, No. 355. The general appearance of the European specimen resembles closely that of the Indian Castor Rust, but unfortunately there was not enough of the European material to allow me to study it under the microscope. This description is rather incomplete as are also the other references to this fungus mentioned above. The rust was first recorded for India in the "Annales Mycologici" in Sydow and Butler's "Fungi Indiæ Orientalis" under the name *Melampsora ricini* in 1906. But no description or figure is given.

So far only the Uredo stage is known, although search has been made for other stages during two years. The generic name of the fungus, therefore,

*The historical information contained in the 1st paragraph was kindly supplied to me by Dr. E. J. Butler, Imperial Mycologist, Pusa, India.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

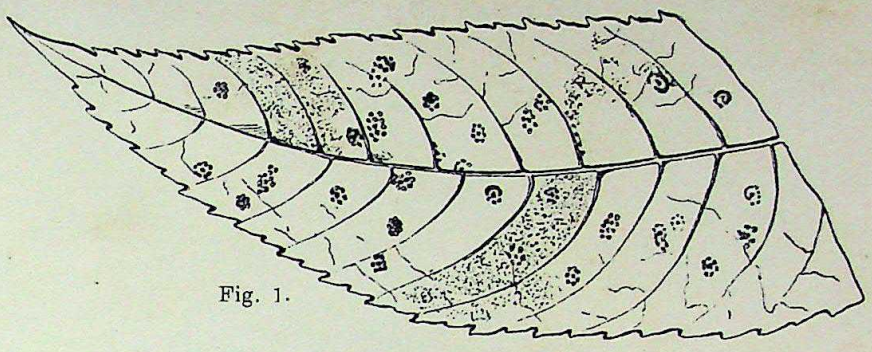


Fig. 1.

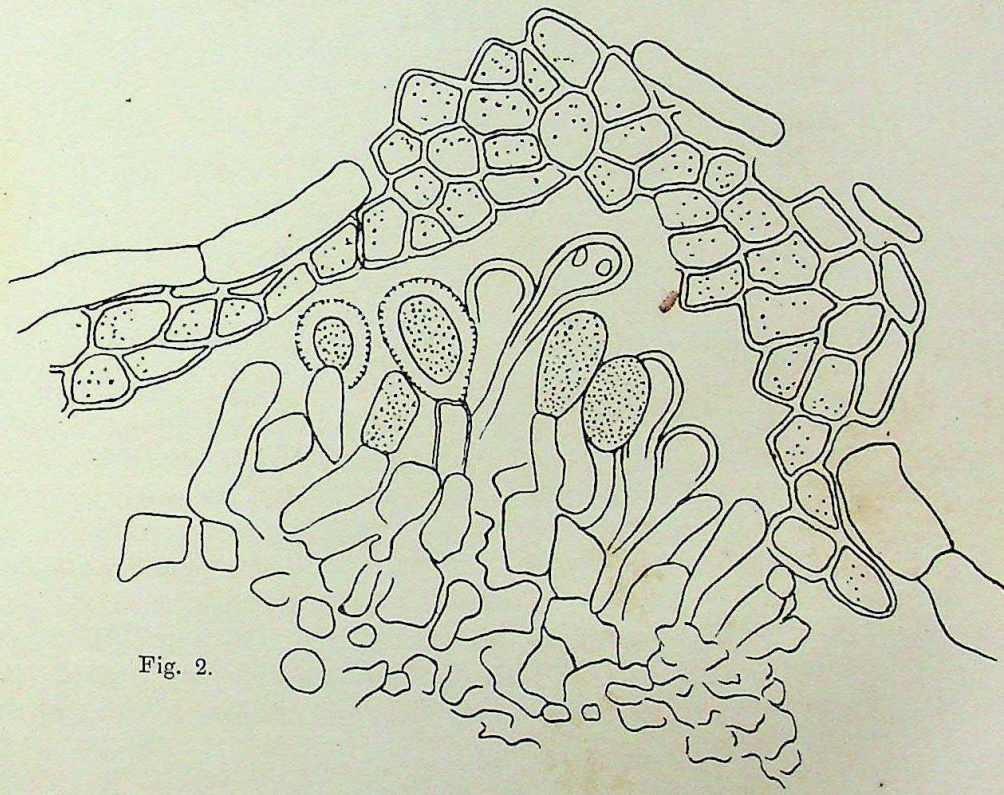


Fig. 2.

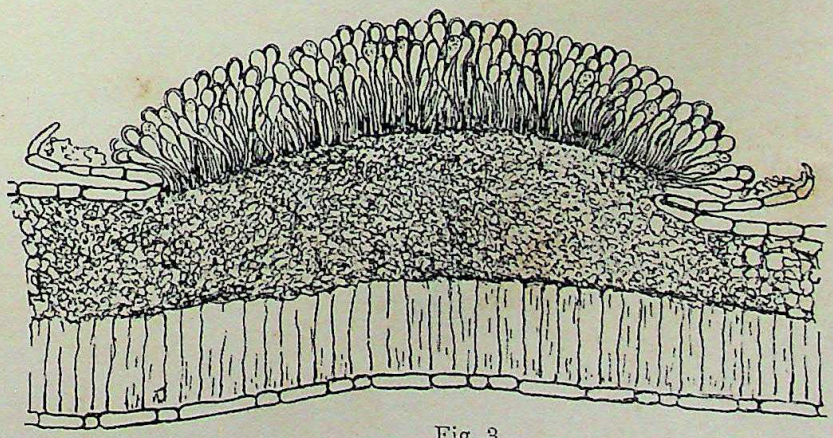


Fig. 3.

CASTOR RUST.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

must still remain doubtful. It is thought desirable, in the meanwhile, to describe in detail the fungus as it occurs in the Indian specimens.

The rust is very common on the Castor plant in the Poona, Belgaum and Dharwar districts of the Bombay Presidency. It is remarkable that it is practically absent from Gujerat, though the varieties commonly grown there are by no means immune to this disease. Plants of all the common Gujerat varieties were grown for experimental purposes on the Poona Agricultural College Farm and these all got the rust.

This rust usually appears between the months of November and February on Castor sown in June as an annual crop. But it has been observed as early as September on some Castor plants more than a year old in the Ganeshkhind Botanical Garden, Kirkee, and from the appearance of the leaves which were entirely covered with pustules, the rust had presumably been there all the summer. The attack is severest in January when practically every leaf of the plant is thickly covered with pustules, and clouds of spores are blown off from them on shaking the plant.

The orange yellow, powdery pustules (Uredosori) are confined to the leaf and occur chiefly on the lower surface, though very rarely they are met with on the upper surface also. They are indicated on the upper surface by minute roundish yellow spots. They occur in large numbers and not infrequently show an arrangement in concentric rings (Fig. 1), and they often run together. In severe cases this arrangement in rings is lost and the entire surface is covered thickly with pustules.

A transverse section of the leaf through a young pustule shows that the Uredo spores are first covered entirely by a peridium consisting of fungus tissue of polygonal cells. (Fig. 2). When mature they become exposed by rupture both of epidermis and peridium, which latter can still be seen as a layer underlying the epidermis. (Fig. 3). The spongy parenchyma below the epidermis is more or less completely occupied by the hyphæ of the fungus which form a sort of a cushion on which the spore-bearing hyphæ arise. The spore-bearing hyphæ separated by manipulation present a characteristic appearance. They are curiously branched and, as a rule, only two of these branches bear spores, the oldest spore being always at the top. (Fig. 4). The other branches are slender, pointed and sterile. Further the Uredo spore bearing hyphæ are intermixed with stout, club-shaped, paraphyses, generally colourless but occasionally the swollen heads showing orange colour. (Fig. 5 *a* & *b*). In the last case the paraphyses are easily distinguishable from the spore-bearing hyphæ by the perfectly smooth outline of their swollen heads. In mature sori the paraphyses generally project beyond the level of the spores.

The Uredo spores are globular or elliptical, echinulate and with orange contents. When examined fresh in distilled water it is possible to distinguish between two kinds of Uredo spores, one with thick walls and the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

other with thin walls. (Fig. 6). There are no gradations between them. This observation recalls a similar one recorded for *Melampsorella aspidiotus* in Engler and Prantl's Naturlichen Pflanzenfamilien I-Teil I-Abteilung, p. 45. It was at first believed that these really represented two distinct kinds of Uredo spores and that the thicker walled spores were of the nature of Amphispores, which, (according to Arthur quoted in McAlpine's "The rusts of Australia") "are developed in arid or subarid regions, being provided with thickened walls to enable them to withstand unfavourable conditions, just like a teleutospore." But further observations throw a considerable doubt on this matter. If the spores from leaves kept dry in the herbarium for a month or two are examined, the proportion of thick-walled spores to thin-walled ones appreciably increases, suggesting that the thin-walled spores may develop a thick wall later on under certain conditions. Again after treatment with lactic acid, the distinction between thin-walled and thick-walled spores practically disappeared, the thin walls swelling almost to the size of the thick walls. The difference in the appearance of the spores examined fresh is, however, so striking that it is considered worth recording.

The fresh spores germinate in distilled water, readily in the months of January and February. The germination is poor earlier in the season. The two kinds of spores germinate alike. (Fig. 7). More than one germ tube are generally protruded but only one grows out finally, the other becoming disorganised. The largest number of germ tubes observed is five, four being the commonest number. The largest number of germ spores observed is six.

The size of the spores varies from 25-29″ × 19-25″.

No other spore form has been observed so far. An Aecidium was found on some Brinjal plants growing in the neighbourhood of the Castor plants on the Agricultural College Farm, Poona. This has been identified, provisionally, with *Aecidium habunguensis* by Dr. Butler. A few inoculation experiments carried on with the Aecidiospores of this gave negative results and there is at present no clue to answer the question whether the rust on Castor has any other spore forms or whether it is one of those rust fungi whose life cycle is restricted to the Uredo stage.

Description of Figures.

(Figures 1 and 3 are free hand drawings. The rest are drawn with Camera lucida.)

Fig. 1.—Portion of rusted leaf of *Ricinus communis*. Natural size.

Fig. 2.—Transverse section of leaf through a young sorus, showing peridium × 860.

Fig. 3.—A mature sorus × 120 about, showing ruptured epidermis and peridium.

Fig. 4.—A spore-bearing hypha separated by manipulation × 400.

Fig. 5.—Uredo-spore-bearing hyphæ and paraphyses × 400.

Fig. 6.—A thin-walled and a thick-walled spore × 500.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

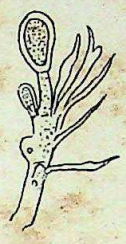


Fig. 4.

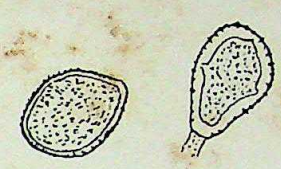


Fig. 6.

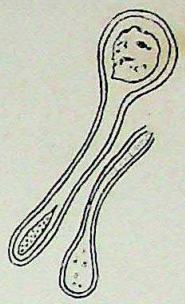


Fig. 5b.

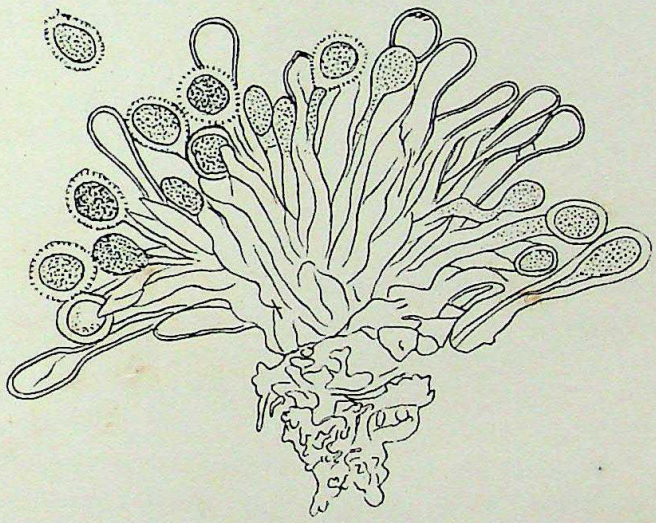


Fig. 5a.

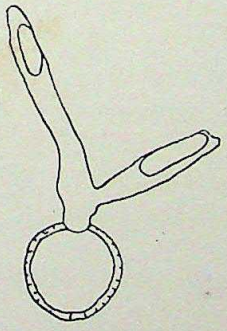


Fig. 7a.

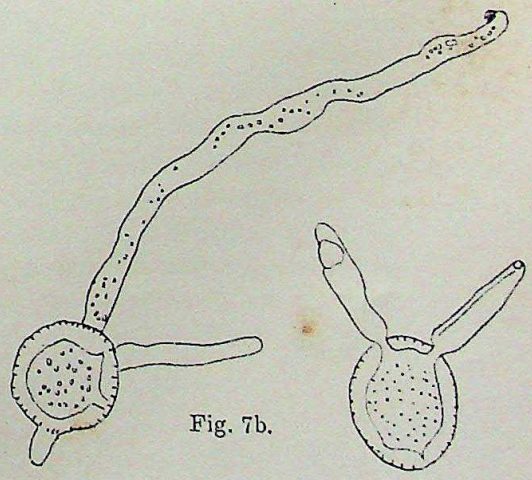


Fig. 7b.

CASTOR RUST.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Fig. 7.—Germinating Uredo spores (*a*) thin-walled (*b*) thick-walled ×500.

S. L. AJREKAR, B.A.,
Assistant Professor of Mycology.

AGRICULTURAL COLLEGE,
POONA, *January* 1912.

No. XXXIII.—NOTES ON CACTI IN NORTH-WEST INDIA.

A considerable number of plants belonging to the Cactaceæ are to be seen in cultivation in N.-W. India, and a few of them have obtained sufficient footing to deserve mention in local floras. The following plants as far as I have observed are firmly established and are capable of holding their own against, or even extending at the expense of the indigenous vegetation :—

Opuntia, Sp. No. 1.—About four feet in height, as a rule spineless, occasionally 1 (—3) spines in some of the tufts of bristles. Leaves $\frac{1}{8}$ in. long, conical, green or reddish. Joints dull, greyish-green, thick, very uniform in size, usually about 6 by $2\frac{1}{2}$ in. Flowers yellow.

The commonest species in the Plains of the Punjab between the Jhelum and the Sutlej, elsewhere it appears to be less common than other species.

Opuntia, Sp. No. 2.—About five feet in height. Spines in tufts of 4-6, the largest very stout awl-shaped, often somewhat curved, pale yellowish-brown with a horny appearance, $1\frac{1}{2}$ in. long, bristles numerous, conspicuous. Leaves pale green, conical, $\frac{1}{8}$ in. long from a broad base. Joints large, dull, bluish green, relatively not thick, usually about $\frac{12}{16}$ by $\frac{6}{8}$ in. more or less undulate when looked at edgeways and at the margin. Flowers yellow. Found with the above but not quite so frequent. Planted in hedges in Rawalpindi.

Opuntia, Sp. No. 3.—About ten feet in height or even more. Very like Sp. No. 2 but spines slender, grey and opaque except when quite young, not curved. Leaves subulate, recurved, reddish at the tip, $\frac{1}{3}$ in. long. Joints not undulate, relatively rather thin. Flowers orange.

Common on the Ridge at Delhi and at and around Jaipur.

Opuntia, Sp. No. 4.—About six or eight feet in height. Spines at first one or several of which one is considerably larger than the rest, as the joints get older the number of spines in a tuft increases by the growth of fresh spines till in old stems as many as ten spines may be seen in each tuft. Leaves dark-brown, slightly recurved, $\frac{1}{4}$ in. long. Joints bright green, very variable in size and shape, narrow-oblong to broad obovate, usually 12 by $\frac{3}{4}$ in. sometimes $2\frac{1}{2}$ feet long and broad in proportion. Flowers yellow.

Widely distributed but not common in the Plains, the only species at all common in the Sub-Himalayan tract. Haripur, Abbottabad, Mansehra, Shinkiari, &c., in Hazara, in the Rawalpindi District not common, frequent throughout the Kangra District at suitable elevations, at many places in Hoshiarpur and Ambala Districts, Solon and Nirth in Simla District. In

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the Plains at Jaipur, Phillaur, Amritsar, Lahore, &c., but less common than other species.

The question arises as to the identification of these species. The various local floras follow the Flora of British India and mention *Opuntia dillenii*, Haw. which cannot cover more than one of these species. An article has appeared in the Records of the Botanical Survey of India, Vol IV., No. 6., by Mr. Burkill called 'Determination of the Prickly Pears now wild in India,' in which the following species are mentioned for the area in question:—*O. monacantha, O. cochinelifera,* and *O. elatior*. Of these *O. cochinelifera* belonging to the sub-genus *Nopalea* I have not mentioned among the four species, which all belong to the sub-genus *Eu-Opuntia*, shortly described above, as I have not seen it except in gardens and hedges in Lahore where it is by no means frequent.

The article referred to does not give any description of the species dealt with, but the following key to the species of Eu-Opuntia is given:—

Spines falling except one long one on each cushion. *O. monacantha.*
Several large spines remaining on each cushion.
Spines all straight, slender, tawny or purplish-black:
Flowers orange. *O. nigricans.*
Flowers at opening lemon yellow changing to rose-pink. *O. elatior.*
Spines some curved, the largest stout, light horn colored in life, darkening in herbaria with age. *O. dillenii.*

None of the species I mention would, according to this key, appear to be *O. monacantha*. No. 1 is, perhaps, the nearest, but in this species the spines do not 'fall leaving only one long one on each cushion,' because as a rule there are no spines at all. *O. monacantha* is referred to as a species on which the cochineal insect lives, and of my species No. 4. is the only one I have seen attacked. In 1906-07 I noticed the cochineal insect on species No. 4, throughout the Kangra District, almost every clump being attacked and in process of destruction. In 1909 I saw the same thing on the same species in the Hazara District, but in a more advanced stage. Here the remains of large clumps of Opuntia were common, the plants as a rule being quite dead, though here and there a few could be seen sprouting up from the root. Burkill mentions that *O. monacantha* has recently been used much for clothing hillocks in Lahore! Now the species used for this purpose is my No. 1, and on it the cochineal insect apparently will not live. When in the Kangra District I made a hedge of species No. 4 together with a few plants of No. 1, almost immediately after planting the former was attacked by the cochineal insect, whereas the latter escaped completely. It is I think evident that Burkill's *O. monacantha* refers to two species. Species No. 2 according to the key would appear to be *O. dillenii*, and No. 3 *O. nigricans*.

I have endeavored to identify the Opuntias I have mentioned with the help

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of Schumann's 'Gesamtbeschreibung der Kakteen,' which is I believe the standard work on the subject. Species No. 1 is, I believe, *O. ficus indica*, Mill., or a closely allied species. Species No. 2 is *O. tuna*, Mill. (Schumann gives *O. dillenii*, Haw. as a synonym). Species No. 3 is very close to *O. nigricans*, Haw., if it is not that species. Schumann remarks that *O. nigricans*, Haw. is related to *O. tuna*, which is certainly true of my No. 3, but Schumann says the flowers of *O. nigricans*, Haw. are yellow. Burkill says the flowers of his *O. nigricans* are orange and that *O. elatior*, differs from *O. nigricans* in the flower being lemon yellow at opening, he identifies the Opuntia at Delhi and Jaipur as *O. elatior*. I agree that the Opuntia at Delhi is the same as the one at Jaipur, I have not seen the flowers of the former place but I saw them at the beginning of the flowering season in Jaipur, and whether just open or still in bud the petals were orange and hence according to the key this Opuntia is *O. nigricans*. The most obvious explanation of the confusion seems to be that *O. elatior* and *O. nigricans* are really one species, the flowers of which are either yellow or orange. Species No. 4 is *O. monacantha*, Haw. Burkill mentions one species of Cereus in his article, *viz.*, *C. pterogonus*, though he does not record it from any place in N.-W. India. There is a large columnar Cactus in this region, it is used by villagers for fencing their fields in and around Anandpur, District Ambala, I have not seen it elsewhere except in gardens. This Cactus is not *Cereus pterogonus*, Lem. it is probably *Cereus peruvianus*, Mill.

The spreading of Opuntias is interesting to study, the fruits ripen of all the species I have mentioned, those of No. 1 in abundance, and they are eaten to some extent by birds, yet birds have little or no share in the spreading of the plants at any rate in N.-W. India. In the plains I have never seen young Opuntias springing up to any distance from old clumps such as one would expect if they were spread by birds. During nearly two years' residence in the Kangra District I took every opportunity to examine young *Opuntia monacantha* plants and with one possible exception found none of the young plants had arisen from seed. They are spread mainly if not entirely by cuttings either planted in hedges by man or by joints broken off by wind or cattle, taking root as they lie on the ground. On steep ground Opuntias spread fairly rapidly down hill and joints are sometimes transported by water and may be found rooting on banks of streams where they have been deposited by floods. In the case of species No. I, and *O. monacantha* the whole fruit after dropping off may take root in the same way as a joint, in fact occasionally they do not fall off the mother plant but sprout and grow just as a joint would. Except in these two species I have not observed the rooting of the whole fruit, but it may perhaps occur with all the species.

R. N. PARKER,
D. C. Forests.

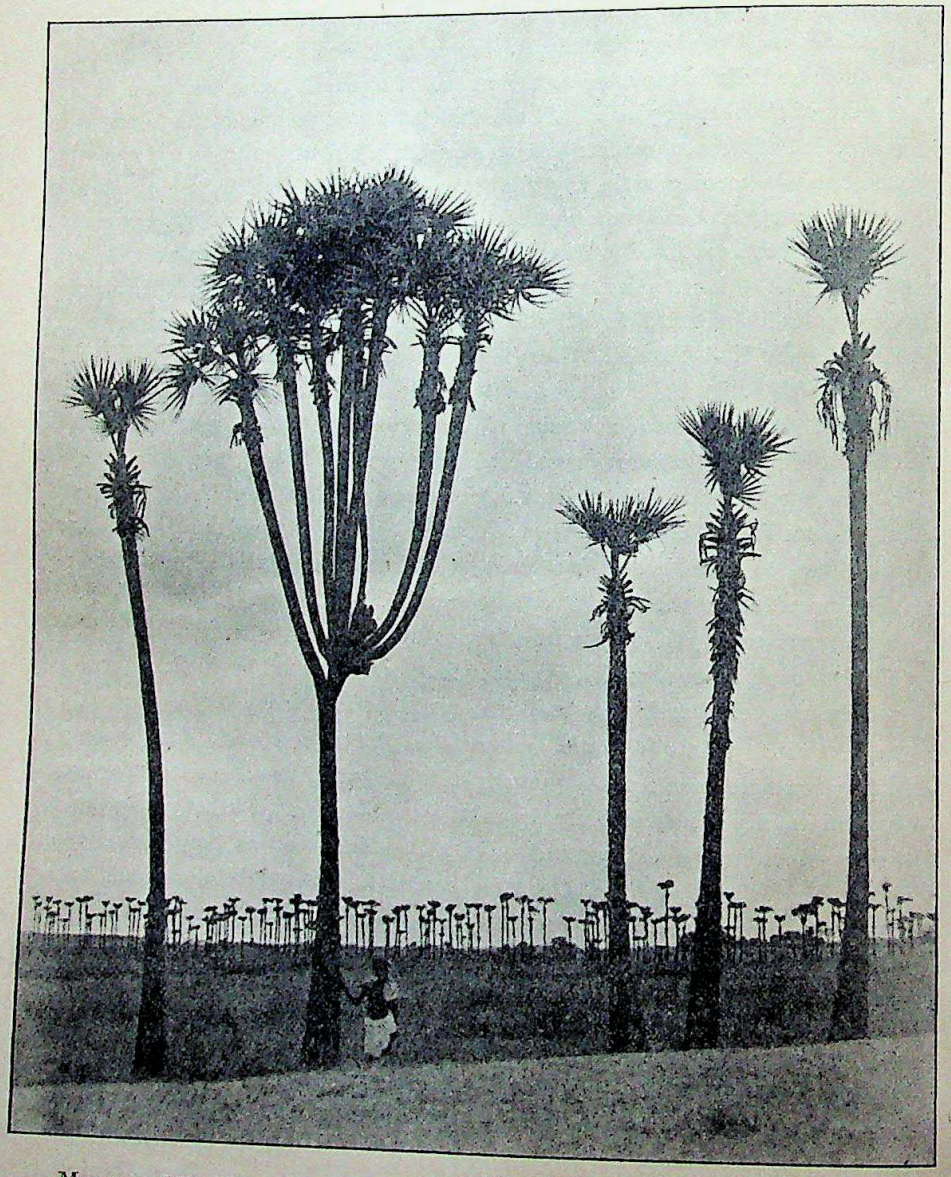
LAHORE, 23*rd May* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXXIV.—A BRANCHING PALMYRA PALM (*BORASSUS FLABELLIFER*).

The accompanying photograph (taken by Mr. E. L. Richardson of the S. I. R.) is of a rather remarable Palmyra palm which is growing in the neighbourhood of Tanjore. The tree at present has eight separate heads, and must at one time have had several more, as the stumps can be clearly seen.



MADRAS, 15*th December* 1911.

R. F. STONEY.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXXV.—RATE OF GROWTH OF A DHAMAN (*ZAMENIS MUCOSUS*) HATCHLING.

On the 15th September I received a clutch of 22 dhaman eggs. Some of these were opened and found to contain fully formed embryos measuring 15·5 inches. Ten eggs were placed in wet straw and allowed to hatch out. Of these, three hatched on the 20th September, one on the 21st, three on the 25th and two on the 28th. One egg did not hatch, but when opened contained a fully formed dead embryo. One of the snakes that emerged on the 20th measured 16·1 inches, while one that hatched on the 28th measured 16·5 inches.

Accounts of the hatching of dhaman eggs and observations on the egg tooth have already appeared in the Journal (Vol. XVII, page 1033); so my intentions were to ascertain the rate at which a hatchling grew and the periods at which it sloughed; but as my subject only lived for a very short period, I give my results for what they are worth.

A hatchling of the 28th, which measured 16·5 inches, was tempted with frogs and lizards, but it refused to eat; nevertheless small frogs and agamoids were carefully thrust down its throat, and by this means I was able to keep it alive for over a month. In all it ate three young agamoids and thirty-six small frogs, and one day, when no frogs were available, some flesh of a rat was administered in small quantities. After two weeks it measured 18 inches and after a month 19 inches, that is to say, in confinement it had grown 2½ inches in a month. It died after the fifth week, but during the fifth week it did not seem to have grown at all. It sloughed on the 5th October, *i.e.*, about a week after leaving the egg, and it showed signs of sloughing a second time on the 25th October, for in handling, the epidermis of the anterior half of the body came away in one piece.

E. A. D'ABREU, F.Z.S.

NAGPUR, C.P., *February* 1912.

No. XXXVI.—THE RUPTURE OF THE EGG-SHELL IN THE *GENUS CALOTES*.

Before reading Capt. Venning's interesting note on the hatching of *Calotes jerdoni* in the last Number of the Society's Journal, I had sent to "Spolia Zeylanica" one on the same phenomenon in *Calotes nigrilabris*. So far as the external appearance of the egg just before the young lizard emerges is concerned, my observations agree closely with Capt. Venning's; but I can find no trace of an egg-tooth in my specimens, and indeed, it is hard to see how a structure of that nature could produce the oblique parallel slits and triangular flap so clearly shown in his figures. My own opinion is that the slits are produced by the long claws of the forefoot.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The manner in which the embryo is packed in the egg and also the nature of the cuts strongly favours this view.

N. ANNANDALE.

INDIAN MUSEUM, CALCUTTA.
May 14th, 1912.

No. XXXVII.—CHINESE GOLD FISH—*CARASSIUS AURATUS.*

I obtained 19 of these gold fish on January 27th, 1912, in the Old Chinese City of Shanghai, where they are bred in large earthenware pans by the Chinese for sale, each pan containing fish of different shapes, sizes and colours, very dirty water and water weeds and they are fed on water insects and rice. In all the gardens of the Chinese houses these fish are kept in little ponds or jars with rocks and ferns round and made pets of by the family, the more ugly the fish the better they are prized and looked after. The various forms are obtained by taking the eggs of the single-tailed variety and shaking or disturbing them, unnatural developments take place and fish with double tails, bulging or goggle eyes, eyes on top of the head-tufted fins and tails, no dorsal fins, &c., are the result; these. if carefully selected, will breed the same kind again.

When the female spawns, the eggs are removed from the big pan to a smaller bowl, as the males eat the eggs; they are then hatched by the heat of the sun. The young fish are nearly black, but gradually become white or red, and later gold, silver or black fish; some attain the large size of 2 feet and live to a great age, and a few of these may be seen in the Chinese public gardens of the old city. Chinese gold fish were first brought from Lake Tsau in the Province of Ngan-Kwin, China.

I placed the 19 fish in two large earthenware jars filled with the dirty water and weeds, with enough water insects for 10 days, food and brought them on board keeping them in a bathroom. On the 3rd day out from Shanghai, I changed them into a marble bath, as the temperature was getting high and the big fish looked sick, giving them fresh cold water which I then changed daily. On February 6th, the first big fish died; February 7th, 4 died; February 8th, 4 more died and February 9th, 1 died, I then removed the 9 back to the earthenware jars and gave up hopes of getting any to Bombay; but from that day to the time of writing, Feb. 14, no more have died. I feel sure that the cause of death was the heat after coming from dead winter and large fish were too fat.

I have two gold fish in my cabin, which I bought in the same place three years ago, and they are quite well and lively, but they have not grown at all.

P. & O. "ARCADIA,"
BOMBAY HARBOUR, *January* 1912.

F. H. S. STONE.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXXVIII.—HORSE-MACKEREL ATTACKING JELLY FISH.

In the book entitled "The Story of Life in the Seas" by S. J. Hickson, F.R.S., page 100, he mentions that it is very probable that none of the Fish will feed upon a transparent Jelly fish. Whilst the P. & O. S.S. "Arcadia," was moored in the Inner Harbour of Aden last March, and on a very calm day, I and several of the other officers saw the following.

A large number of purple Jelly fish were round the ship and on the surface, each one about one foot across the back and all with very long tentacles; suddenly a small shoal of Horse-mackerel (*Caranx* sp.) dashed at one of these Jelly fish and began tearing and biting off the tentacles and apparently eating them; the Jelly fish could do nothing and was turned over and until at last there was nothing left but the upper part of the belly (body): then this shoal made for and attacked another in the same way, whilst other shoals were killing three more Jelly fish. The Horse-mackerel were only about 6 inches long, and our native crew caught quite a number of them. It is strange, as I believe the Jelly fish is quite a foster mother to very young Horse-mackerel, dozens of them are to be seen swimming about the tentacles of large Jelly fish, where they seem to get for protection.

F. H. S. STONE.

P. & O. S.S. "ARCADIA,"
HONG-KONG, CHINA, *February* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PROCEEDINGS

OF THE MEETING HELD ON 14TH MARCH 1912.

A MEETING of the members of the Bombay Natural History Society took place on Thursday, 14th March 1912, at the Society's Rooms, Mr. John Wallace, C.E., presiding.

NEW MEMBERS.

The election of the following 24 new members since the last meeting was duly announced :—

Lt. G. H. A. Pearson (Jullundur, Punjab); Mr. R. W. L. Dunlop (Bombay); Mr. H. N. Randle (Benares); Capt. J. F. C. Carter (Bassein, L. Burma); Mr. G. Somerville (Bassein, L. Burma); Mr. G. A. Levett-Yeats (Ghazipur); Mr. E. O. Bloch (Rangoon); Mr. H. M. Chibber, M.A. (Poona); Major G. P. Evans (Malakhand); Capt. W. J. Massy (Myitkyina, U. Burma); Mr. H. B. Player (England); Mr. P. S. Quarry (Jessore, Bengal); Mr. C. W. Skinner (Dehra Dun, U. P.); Mr. A. C. Rumboll (Bombay); Mr. J. R. Phillips (Insein, Burma); Mr. J. C. C. Wilson (Papun, Burma); Mr. F. Boxwell (Cachar, Assam); Mr. O. H. Walters (Rawalpindi): Capt. J. A. Scarlett, R.H.A. (Transvaal); Mr. V. N. Ffolliot Powell (Beawar); H. E. Lord Carmichael, G.C.I.E., K.C.M.G. (Madras); the Marquis of Bute (Edinburgh, Scotland); Mr. C. E. Aitken, P. W. D. (Mirpurkhas) and Dr. P. V. Casling, I.S.M.D. (Rawalpindi).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contributions.	Locality.	Donor.
1 Tiger (*Felis tigris*) skull ..	Mishmi Country ..	Mr. W. J. H. Ballantine.
1 Golden Cat (*Felis temmincki*) Skin.	Akyab, U. Burma.	Commander Willock, R.I.M.
1 Large Indian Civet (*Viverra zibetha*) Skin.	Bhamo District ..	Major W. B. T. Abbey.
3 Skins of Wild Dogs (*Cuon dukhunensis*) puppies.	Saugor, C. P. ..	Mr. D. O. Witt, I.F.S.
1 Giant Squirrel (*Ratufa gigantea*).	Abor Country ..	Mr. G. M. McCleverty.
1 Pallas's Squirrel (*Sciurus erythraeus*) and Stevens's Squirrel (*Sciurus stevensi*).	" " ..	Do.
Head and fœtus of large brown Flying-Squirrel (*Pteromys candidulus*).	" " ..	Dr. J. N. Faulkner.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Contributions.	Locality.	Donor.
1 Burmese Mole Rat (*Gunnomys varius*).	Rangoon	Dr. H. Marshall.
1 Painted Bat (*Kerivoula picta*). ..	Colombo	Mr. F. H. Stone.
6 Bats in Spirit	Ratnagiri ..	Mr. G. S. Hardy, I.C.S.
6 Pairs of Takin Horns (*Budorcas taxicolor*).	Mishmi Country..	Mr. W. J. H. Ballantine.
17 Bird Skins	" " ..	Captain F. Bailey.
13 Bird Skins	Hasimara, Duars..	Mr. H. V. O'Donnel.
1 Wall Creeper (*Tichodroma muraria*).	Raipur, Kangra..	Mr. Lionel Donaldson.
1 Red Turtle-Dove (*Œnopopelia tranquebarica*).	Meerpur, Champaram.	Mr. M. Mackenzie.
1 Great White belied Heron(*Ardea insignis*).	Hasimars, Duars..	Mr. H. V. O'Donnel.
Grey Lag Goose (*Anser cinereus.*).	Munchar Lake, Sind.	Mr. P. M. D. Sanderson.
Comb Duck (*Sarcidiornis melanonotus*).	Sunjval, Sind. ..	Mr. R.L. McCulloch.
Baikal Teal (*Nettium formosum*). ..	Dibrugarh, Assam.	Mr. Evan E. Evans.
" " (" ") ..	Sibsagar, Assam..	Mr. F. W. Gore.
Pintal Snipe (*Gallinago stenura* semialbino).	Calcutta.. ..	The Hon. Mr Justice Chitty.
Jack Snipe (*Gallinago gallinula*) dark variety.	Thar and Pakar..	Mr. E. Priestley.
Johns Earth Snake (*Eryx johhnii*).	Lucknow.. ..	Major J. H. Hudson.
Russell's Earth Snake (*Eryx conicus*).	Santa Cruz ..	Mr. R.W.L. Dunlop.
1 Green Whip Snape (*Dryophis mycterizans*).	Colombo	Mr. F. H. Stone.
1 Buff Striped Keelback (*Tropodinotus stolatus*).	Colombo	Mr. F. H. Stone.
1 Snake (*Helicops schistosus*). ..	Colombo	Mr. F. H. Stone.
1 Snake (*Zamenia fasciolatus*), and two Sea Snakes.	Persian Gulf ..	Captain F. W. Townsend.
1 Cobra (*Naia tripudians*). ..	Andheri	Col. K. R. Kirtikar, I.M.S. (Retd.)
1 Snake and a Lizard	Anamally Hills ..	Mr. T. Bainbrigge Fletcher.
2 Lizards (*Calotes ophiomachus*) (alive)	Colombo	Mr. F. H. Stone.
1 Chameleon (*Chamæleon calcaratus*)	Jholwad	Mr. A. M. D'Cruz.
6 Ceylonese monitors	Colombo	Mr. F. H. Stone.
9 Gold Fish (*Carassius auratus*) alive.	Shanghai.. ..	Mr. F. H. Stone.
4 Fishes & 2 Crustaceans ..	Persian Gulf ..	Captain F. W. Townsend.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Contributions.	Locality.	Donor.
2 King Crabs and some Oysters, etc.	Various	Mr. F. H. Stone.
80 Moths and Butterflies.. ..	Various	Mr. F. H. Stone.
20 Pieces of Coral..	Singapore ..	Mr. F. H. Stone.
150 Fossils	Bhuj, Cutch ..	Mr. J. H. Smith.

Minor contributions from :—Mr. T. Bainbrigge Fletcher, Mr. A. Gover, Capt. C. Thornhill and Mr. G. Arnold.

ADDITIONS TO THE LIBRARY.

Zoogeography Physical Atlas, 1911.. (Barthelomew, Clarke and Grimshaw).
Birds of Uganda .. .. .. (Van Someren).
Unexplored Spain .. .. .. (Abel Chapman and Walter J. Buck).
My life among the wild birds in Spain .. .. (Willoughby).
By Mountain, Lake and Plain .. (Major R. L. Kennion).
Thirteen years among the wild beasts of India .. .. (G. P. Sanderson).

ACCOUNTS FOR 1911.

Mr. L. H. Savile, the Honorary Treasurer, in submitting a statement of the accounts for the year ending 31st December 1911, said :—I beg to call attention to the fact that the opening balance at the beginning of the year was Rs. 2,960-10-11, and the closing balance was Rs. 2,494-7-9, showing an excess of expenditure over income of Rs. 466-3-2. Although this is not a very large deficit, when compared with last year, which showed a surplus of Rs. 8,485-9-3 it is a serious falling off. With regard to the receipts which are Rs. 3,037-3-4 less than in 1910, the subscriptions are Rs. 600-0-1 less, entrance fees Rs. 1,079-4 less and sale of Duck Book Rs. 2,424-12-6 less. This latter source of income was practically expected to cease this year as the issue was nearly all sold last year, but what is more serious is the reduction in the amount of entrance fees, meaning as it does that the number of new members joining has decreased by 118. While the receipts have diminished, the expenditure has gone up by Rs. 4,945-15-10 as compared with last year, the principal items of increase being rent for the additional rooms taken over Rs. 750, salaries of staff Rs. 1,131-10-10, Journal account Rs. 3,302-8-3. These increased expenses are all very necessary if the Society is to carry on the work it has undertaken and the way in which members can best assist in helping on this work is to induce others to join the Society or in agreeing to a substantial increase of the annual subscription.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A separate account has been opened during this year to deal with the finances of the MAMMAL FUND which has been started for the purpose of making a mammal survey of India. The amount subscribed to this fund up to 31st December 1911 was Rs. 23,530-1, the expenditure to the same date being Rs. 7,786-15, showing the balance in hand of Rs. 15,743-2. Two collectors are now working on the collection of mammals for this survey, and provided funds are forthcoming, they will continue until a survey of the whole of India and Burma has been completed. The expenses of the two collectors amount to about Rs. 750 per mensem.

ELECTION OF THE COMMITTEE.

The following gentlemen were elected as office bearers for the present year:—*President:* H. E. the Right Hon'ble Sir George Sydenham Clarke, G.C.M.G., G.C.I.E., F.R.S.; *Vice-Presidents*: Mr. J. D. Inverarity, B.A., LL.B., Rev. Fr. Dreckmann, S.J., and the Hon. Mr. Justice N. C. Macleod; *Hony. Secy.*: Mr. W. S. Millard; *Honorary Treasurer*: Mr. L. H. Savile; *Honorary Librarian*: Mr. P. M. D. Sanderson; *Managing Committee*: Mr. E. C. Stuart Baker, F.Z.S., Mr. T. R. Bell, I.F.S., Mr. C. L. Burns, Mr. Wm. Burns, Mr. E. Comber, F.Z.S., Lt-Col. G. H. Evans, F.L.S., C.I.E., Capt. W. H. Evans, R.E., Prof. G. A. Gammie, Mr. E. Ernest Green, F.E.S., Mr. N. B. Kinnear, Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.)., Mr. H. Maxwell Lefroy, M.A., F.E.S., F.Z.S., Major W. G. Liston, I.M.S., Mr. J. McNeill, I.C.S., Dr. A. Powell, Mr. G. M. Ryan, I.F.S., Major F. Wall, I.M.S., C.M.Z.S., Mr. John Wallace, C.E. and Mr. T. Bainbridge Fletcher.

The members and their friends spent the evening in the Museum examining the Society's collections. Among the exhibits were 155 skins of mammals which had just been received from Mr. G. C. Shortridge (the Society's Collector), from the South Dharwar District. These specimens were being forwarded to the British Museum for identification and return.

EXHIBITS.

Mrs. W. H. Deakin exhibited a collection of marine shells made by her in Back Bay, Bombay, and also some beautiful paintings of flowers. Mr. C. D. Mahaluxmivala, Superintendent, Victoria Gardens, exhibited 3 orchids in flower—*Dendrobium parishii, ochreatum* and *gratissimum*.

OF THE MEETING HELD ON 9TH APRIL 1912.

An "At Home" of the members of the Bombay Natural History Society took place on Tuesday evening, 9th April 1912, Rev. F. Dreckmann, S. J., presiding.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NEW MEMBERS.

The election of the following 11 new members since the last meeting was announced:—Mr. M. F. Delaney, Bombay; The Secretary, Rawalpindi Club, Rawalpindi; Mr. J. D. Way, Nowrangpur, Vizagapatam District; Lt. H. E. Shortt, I.M.S., Benares; Mr. John Stewart, Travancore; Mr. V. A. Mendoza, Bombay; Mr. J. E. Webb, Bilaspur, C.P.; Mr. E. Maconochie, I.C.S., Dharwar; The Inspector of Schools, Surma Valley and Hill Districts, Silchar, Assam; Mr. G. A. Laughton, Uran, Kolaba District; and Mr. W. P. Appleford, Gilgit, Kashmir.

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contributions.	Locality.	Donor.
1 Skin Domestic Cat (*Felis domestica*) yellow variety.	Ahmednagar ..	Lt.-Col. J. Girvin, R.A.M.C.
3 Bats (in spirit)	Ratnagiri ..	Mr. G. S. Hardy, I.C.S.
1 Hare (*Lepus ruficaudatus*) skin	Aibheel, Assam ..	Mr. W. P. Field.
8 Bird skins	Meerut	Mr. H. C. Jeddere Fisher.
3 Do. do.	Thayetmyo, Burma.	Mr. J. P. Cook.
26 Eggs of 6 species of birds ..	Kashmir ..	Mr. H. C. Jeddere Fisher.
1 Common Snipe (*Gallinago cœlestis*).	Tonk, N. W. F. P.	Mr. C. R. Pitman.
3 Eggs of common Sandgrouse (*Pterocluru exustus*).	Khandwa, C. P...	Mr. C. H. Dracott.
1 Lizard and 4 toads	Palni Hills ..	Mr. C. E. C. Fischer
43 Butterflies and Moths ..	Various ..	Mr. H. C. Jeddere Fisher.
115 Butterflies	Nilgiris ..	Captain G. Hare.

Minor contributions from Captain H. Thornhill, Mr. W. D. Cumming and Mr. J. Florence.

EXHIBITS.

No fewer than 265 specimens of mammals from the Central Provinces collected by the Society's Collector (Mr. C. A. Crump), and a number of specimens of mammals from the S. W. Dharwar and East Kanara Districts (collected by Mr. G. C. Shortridge) were exhibited and admired. These specimens were being forwarded to the British Museum for identification and return.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MAMMAL SURVEY.

The Secretary announced that he had just received an intimation that the Royal Society had been good enough to sanction a grant of £25 towards the survey of the Mammalian fauna of India, Burma and Ceylon organized by the Society. The Government of Madras had also kindly promised the sum of Rs. 2,500 towards this survey. It had been found that the area to be covered was so enormous that the survey would, with only two collectors, take much longer than was at first estimated and it became necessary therefore to obtain a further Rs. 30,000 or Rs. 40,000 in order that the survey might be thoroughly carried out, and it was hoped that members and others would send in subscriptions to enable the Society to accomplish this scientific work.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CONTENTS OF THIS NUMBER—(*contd.*).

PAGE

MISCELLANEOUS NOTES :—

I.—Notes on Tigers. By C. E. C. Fischer, I.F.S. 1062
Do. „ F. Dewar, I.C.S. 1062
Do. „ Lt.-Col. R. G. Burton 1062
Do. „ Capt. V. A. S. Keighley 1063
II.—Notes on Panthers. By Lt.-Col. R. G. Burton 1063
III.—A large Oorial Head. By Col. H. V. Biggs 1065
IV.—The so-called one-horned Sheep of Nepal and other Breeds. (*With a Plate*). By Lt.-Col. J. Manners Smith 1066
V.—Some Notes from the Abor Expedition. By Major Alban Wilson 1068
VI.—Do Chinkara (*Gazella bennetti*) drink water? By Lt.-Col. R. G. Burton 1068
Do Chinkara (*Gazella bennetti*) drink water? By F. Dewar, I.C.S. 1069
VII.—Recovery of Animals from injuries. By W. J. H. Ballantine 1069
VIII.—Note on Takin (*Budorcas taxicolor.*) (*With 2 Plates*). By Capt. F. M. Bailey 1069
IX.—Gayal or Mithan (*Bibos frontalis*). By Capt. F. M. Bailey 1071
X.—Tsine (*Bibos sondaicus*) found with village cattle. By T. A. Hauxwell, Burma 1072
XI.—Notes on Birds from Lahore. By A. E. Jones 1073
XII.—Nestling Plumage of (*Esacus recurvirostris*) the Great Stone Plover. By H. Whistler 1074
XIII.—The Himalayan Greenfinch (*Hypacanthis spinoides*). By H. Whistler 1074
XIV.—Distribution, Habits, and Nesting of the Himalayan Greenfinch (*Hypacanthis spinoides*, Vigors). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1075
XV.—The Long-tailed Grass Warbler (*Laticilla burnesi*, Blyth). By H. Whistler 1080
XVI.—Nidification of Burmese Great Black Woodpecker (*Thriponax feddeni*). By J. Pemberton Cook 1081

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

MISCELLANEOUS NOTES—*contd.*

XVII.—A Kite's Larder. By G. L. Remington 1082

XVIII.—Occurrence of the Common Peafowl (*Pavo cristatus*) in the neighbourhood of Simla, N.-W. Himalayas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1082

XIX.—Swinhoe's Snipe (*Gallinago megala*) near Madras. By R. F. Stoney 1083

XX.—Cruelty to Wild-fowl, etc., in Sind. By Captain C. H. Elliot 1083

XXI.—The Himalayan Snow Cock (*Tetrogallus himalayensis*). By W. G. Appleford 1084

XXII.—Woodcock (*Scolopax rusticula*) in South Andamans. By Major J. H. Whitehead 1085

XXIII.—Notes on the Habits of Swinhoe's Reed Warbler (*Urosphena squamiceps*) and on the Nesting of the Burmese Great Woodpecker (*Thriponax feddeni*). By J. P. Cook 1085

XXIV.—Chinese Grey Duck in Burma. By Major H. H. Harington 1086

XXV.—Nidification of Davison's Babbler. By Hon'ble Mr. Justice S. M. Robinson 1088

XXVI.—The Sheldrake (*Tadorna cornuta*) in the United Provinces. By F. B. Scott 1089

XXVII.—Notes on some Birds from the Chindwin Valley. By Cyril Hopwood 1089

XXVIII.—Baikal or Clucking Teal (*Nettion formosum*) shot in Assam. By Francis W. Gore 1090

Baikal or Clucking Teal (*Nettion formosum*). By Evan A. Evans 1091

XXIX.—Insects in the Nests of the Common Swift (*Cypselus affinis*). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1091

XXX.—Distribution of the Cricket (*Schizodactylus monotruosus*). By Lt. W. P. C. Tenison, R.F.A. 1091

XXXI.—Intelligence of Ants. By F. B. Scott 1092

XXXII.—The Castor Rust (*Melampsorella ricini*, De Toni) (*With Plates A and B*). By S. L. Ajrekar, B.A., Assistant Professor of Mycology, Poona 1092

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

JOURNAL
OF THE
Bombay Natural History Society.

Nov. 1912. VOL. XXI. No. 4.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART VIII.

With Plate VIII.

(*Continued from page 739 of this Volume.*)

SYPHEOTIS BENGALENSIS.

The Bengal Florican.

Otis bengalensis.—Gm. Syst. Nat. i, p. 724 (1788); Hodgson, J. A. S. B., xvi, p. 883.

Otis delicosa.—Gray and Hardw., Ill. Ind. Zool., i, pp. 61 and 62.

Sypheotides bengalensis.—Blyth, Cat. B. Mus. As. Soc., p. 258; Jerdon, B. of Ind. iii, p. 616; Godwin Austin, J. A. S. B. xiv, part II, p. 84.

Sypheotis bengalensis.—Hume, Nests and Eggs, p. 559; *id.*, Hume and Marsh., Game B. i, p. 23, iii, p. 424; Hume, Cat. No. 838, Str. Feath. viii, p. 111; *ibid*, ix, p. 199; Markham, *ibid*; Fasson, *ibid*, p. 200; Butler, *ibid*, x, p. 162; Hume and Cripps, *ibid*, xi, p. 312; Oates in Hume's Nest and Eggs, 2nd Edit. iii,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

p. 378; Finn, Indian Waders, p. 123; Inglis, Journal B. N. H. Soc. xiv, p. 766; *id, ibid*, xvi, p. 73; Wall, *ibid*, xvi, p. 388; Stuart Baker, *ibid*, xvii, p. 538.

Houbaropsis bengalensis.—Sharpe, Cat. B. M. xxiii, p. 315; *id.*, Hand L. i, p. 175; Oates, Cat. Eggs. B. M. i, p. 88; *id.* Game B. of Ind. i, p. 414.

Vernacular Names.—Charas, Chars, Charat, *H*; Dahar, Ablak ♂ Bor ♀, *Terai*; Ulamora, *Assamese*; Dao-tiriling, *Cachari.*

Description, Adult male.—Whole head, neck and lower parts very glossy black, in some lights shewing a distinct blue or purplish sheen, more especially on the feathers of the breast and crest. Back black, each feather with two broad bars of buff mottled with black, the general appearance of the back being thus a mottled black and buff, the former predominating. The bases of the feathers are black and in quite freshly plumaged birds there is a narrow buff fringe to the tips of the feathers, which, however, soon gets abraded off so that the tips generally appear black. Inner scapulars like the back, but the mottlings are even more irregular, the centres to the feathers are chiefly black and the surrounding portions vermiculated buff and black. Tail, four centre feathers like the back, but the outermost are entirely black with narrow white tips and the intermediate feathers grade from one to the other. Outer scapulars black, a few of the feathers more or less mottled with buff, on the inner webs, inner secondaries like the back, but with numerous bars of black, not always the same in number; remaining quills white, except the outer webs and part of the inner webs of the first and second primary, which are black; in some birds the outer web of the third primary is also nearly all black and this black diminishes in extent on each succeeding quill, remaining only as a black tip to the outer webs of the innermost primaries and disappearing altogether on the outer secondaries. The shafts of all the wing quills are black.

Bill, upper mandible dark brown, sometimes with a leaden tinge, lower mandible paler and more leaden and often with a yellow tinge on the basal two-thirds. Iris brown, Hume says sometimes yellow. Legs straw yellow, sometimes with a tinge of green or plumbeous.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Wing 13·2″ to 13·75″; bill, from feathers above nostril on culmen, 1·2″ to 1·25″, from gape 2·12″ to 2·44″; tarsus about 5″ or a little over; tail 6·5″ to 7·25″.

Tarsus 5·6″ (Blanford).

Tarsus 6·12″ to 6·75″ (Hume).

The feathers of the crest are long and somewhat lanceolate and measure from 3″ to 4″ or even more. The feathers of the hind neck average about 2″ and below the neck they increase gradually in length from the tiny feathers of the chin to feathers on the fore neck of over three inches and to the final tuft of feathers on the breast which may be as long as six inches in old, fully plumaged birds.

In some birds which are more than usually richly coloured there is often a rufescent shade in the buff colour on the upper parts.

Adult female and male in first plumage.—Crown, dark brown, sometimes almost black, with a certain amount of buff speckling and buff edges to the posterior feathers; a broad coronal streak of mottled brown and buff; supercilia and lores buff, generally immaculate but the former sometimes with a few dark specks; feathers of short crest buff speckled with black or brown and with dark centres and shafts. Chin, upper throat and centre of lower throat buff or sand colour unspotted, remainder of neck sandy buff freckled and narrowly barred with black or brown, the bars not being definite enough to make the neck look more than freckled. Down each side of the neck the feathers are centred with dark streaks, making two fairly definite lines which coalesce on the neck adjoining the breast, the feathers of this part seem often to be a richer shade of buff than elsewhere on the plumage. The back, scapulars and inner secondaries are black, mottled and freckled with buff except in the centre of each feather and with broad sub-edges of buff in a V. shape. On the secondaries and outer scapulars the markings are bolder and the black assumes the shape of fairly definite bars. Wing coverts pale buff with a rufous tint here and there and with sparse markings in the form of broken bars of black or deep brown, not numerous enough or regular enough to break the general contrast of these pale buff feathers with the plumage of the back. Remainder of wing quills

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

black, the outermost feather with a faint suggestion only of mottled bars of buff on the inner web, these increasing in extent until the whole of the inner secondaries are mottled black and buff. Rump like the back but less broken with buff; tail mottled black, or brown, and buff, the mottling decreasing in extent on the outer tail feathers which are fairly distinctly barred with broken black and buff. Upper breast and edge of flanks buff speckled with black or brown like the neck; flanks, where covered with wing, mottled with black; remainder of lower parts pale, sandy buff, often slightly darker on the under tail coverts which are sometimes speckled with dark brown.

Irides yellow, dingy to almost golden, bill like that of the male but paler and often fleshy towards the base of the lower mandible; legs dingy yellow or straw colour. Wing 13·2″ to 14·50″; bill at front 1·50″ to 1·54″ and from gape 2·2″ to 2·5″; tarsus 5·6″ or over: tail 6·5″ to 7·25″.

The measurements given above for males and females, which are taken from a series of 14 males and 11 females, all fully adult, would seem to shew that the females are very little larger than the males, but this is not really the case as she is a far heavier and more bulky bird. I have two records of exceptionally heavy cocks, one shot by Mr. Mundy in Dibrugarh, Assam, and another by Mr. J. Harrison of the same district, which both weighed between 3½ and 3¾ lbs. Most males, however, are less than 3 lbs. in weight, young cocks of the year seldom exceeding 2½ lbs. Females, on the contrary run up to 5 lbs., a weight which has been recorded by Mr. A. Primrose and others; they often exceed 4 lbs. and even females of the first year seldom weigh less than 3½ lbs.

Young male.—The young male is at first like the female and commences to assume the adult male plumage in the second year, that is in its first spring moult, but probably often reverts, more or less, to female plumage in its autumn moult, retaining, however, the white wing-coverts of the adult male.

The complete adult plumage of the male is assumed in the most irregular manner, and at the first spring moult the young cock bird may assume any portion of the adult plumage retaining elsewhere

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

that of the female. Nearly always, however, the white wing feathers are amongst the earliest to shew themselves.

Some young birds first moult into the adult black plumage from the breast downwards, having this part wholly glossy black, although, with the exception of the wings, the rest of the body remains clothed in female garb. Other young males retain their first feathering on the upper parts, but commence to assume the black feathers of the throat as well as that of the lower parts in a lesser degree. One such specimen I have examined has the whole of the upper part in juvenile plumage with the exception of a few white feathers amongst the wing-coverts; below, from the chin to the breast the black feathers are growing profusely, though there are still a few feathers here and there retaining their original vermiculated appearance; from the lower breast downwards the whole lower plumage is a soiled white, with a good many black feathers showing all over as well as a few vermiculated ones.

This young bird is a most interesting one as it would appear that sometimes, whilst the upper breast, neck, head and upper parts assume the adult plumage directly, though by varying degrees; the plumage of the lower parts goes through a transition stage. The whole of the buff in the bird has been replaced with white, though there are but few of the adult black feathers yet showing.

The question as to whether the Florican has a separate breeding plumage and changes back again during the autumn moult into a non-breeding, or post-nuptial plumage may, I think, be now decided to the contrary.

Blyth is responsible for the generally accepted theory that the cock-bird changed into a semi-female plumage in autumn which it regained the succeeding spring, and doubtless he had then a good deal of information before him on which to ground his arguments. Blyth writes "Mr. Hodgson is also certainly mistaken in his assertion that the nuptial dress is worn permanently, as we have witnessed the change before described and the subsequent partial removal of the breeding livery, which latter was not well developed in captivity, and have likewise observed the fact in the skins of wild birds." Hodgson, on the other hand, says "The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

moults are two annually, one from March to May and the other autumnal, which is less complete and more speedily got over, between August and October. The young males, up to the beginning of March, entirely resemble the females, but the moult then commencing gradually assimilates them to the adults, which never lose, as the lesser species or Likh does, after the courting season, the striking black and white garb that in both species is proper to the male sex, and permanently so to the larger species after the first year of age. There is, properly speaking, no nuptial dress in this species, though the hackles and crest in their most entire fulness of dimensions may be in part regarded as such."

Now this statement of Hodgson's seems to be entirely correct, except as regards one important particular. He considers, as we have seen, that the Bustard assumes adult plumage in two moults, or even in one, and that after the *first* year the young bird retains permanently its adult colouration; I would change first year to second year.

We know now that just as many fully plumaged adult males are seen during the cold weather, say from November to the end of February as at any other time of the year. I have seen magnificent specimens of cocks moulting in April from adult plumage to adult plumage. But, on the other hand, I have several times seen *non-adult* cock-birds, which were in an intermediate stage remoulting in autumn and shewing some new feathers coloured as in the female. From this we may, I think, infer that it takes the young cock at least two years before it assumes the full plumage of the breeding cock. It will be seen that Blyth does not say that his Bustard, after having a retrograde moult, then moulted in the succeeding moult into full feathering, but he puts down this failure to assume the fully adult garb to the effects of captivity. The facts, in reference to the assumption of the fully adult plumage, appear to be these. In the autumn moult of its first year the young male bird retains its female plumage, but in the succeeding spring moult acquires a colouration intermediate between the two sexes. The autumn moult of the second year may often see the young cock lose a certain amount of the colouring he had gained in the spring, but at the next spring moult he goes further still

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

towards the plumage of the adult, and on the completion of this moult, when he is just under two years old, he either obtains the adult plumage in full or else he does so at the second yearly moult in the autumn. From this time onwards there is no further retrograde step. Of course, I have seen very many cocks in the winter in either wholly female or half stage feathering but these have been small birds which, though they were sometimes very fat and in prime condition, never weighed more than 2 to 2½ lbs. There is no doubt that a cock Florican takes at least two years to grow to his greatest size and weight, and it is but natural that his dress should keep pace with his growth and that he should not arrive at his full splendour of plumage until he also arrives at his full vigour and size.

Distribution.—Although so many years have passed since Hume described the habitat of the Florican, there is but little to add to his account; he says "The Bengal Florican is almost confined to Eastern Bengal, the valley of Assam, the Bhutan Dooars, and those portions of Bengal, Oudh and the North-Western Provinces lying North of the Ganges. Jerdon says that it spreads through the valley of the Jumna into Rajputana, the Cis-Sutlej States, and parts of the Punjab; but this is wrong. It is the Houbara that is found in these localities, not the Bengal Florican; but sportsmen constantly call the Houbara the Florican, and hence the mistake. I have never seen the true Florican anywhere west of the Kadar of the Ganges, except as a rare straggler in the Dun; and there again it does not, to the best of my belief, extend further than the Kadar of the Jumna. In Meerut I have killed both the Houbara and the Likh, but it is only when you get quite down into the Kadar of the Ganges at Hastinapur and Makhdumpur, or again southwards below Garhmuktesar, that you meet the true Florican, and here we used to pick up a few couples every cold season.

"This species has been recorded from Tipperah and Sylhet, but Captain Williamson tells me he has never seen it in the latter, and both he and Mr. Inglis say the same as regards Cachar.

"This Florican is essentially Indian, and extends so far as we know, nowhere beyond the limits of the empire. It is *possible*,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

however, that it may hereafter be found to occur in the country immediately East of Assam."

To this, in a footnote, Hume adds that it is certainly to be found as far west as Nuddea.

Roughly speaking, this beautiful Bustard is confined to the grass land area North and East of the Ganges and on either side of the Brahmapootra; outside of this it is but a straggler. My furthest record South-East is from the district of Chittagong, whilst in the Assam Valley it extends to the extreme Eastern limit of the grass lands and churs bordering the Dihong, Dibong and Brahmapootra Rivers running right up to the very foot of the Hills, both to East and North. It is found in the Terai in some numbers, wherever the country is suitable, and in the same way throughout the Dooars, South of Nepal and Bhutan. In Assam it is common in many districts and extends all through the Assam Valley from Rungpur and Goalpara to Dibrugarh. From the Surma Valley it is shut out by the Garo, Cachar and Khasia Hills, and though it is common in parts of Nowgong to the North of these ranges it is of extreme rarity anywhere to the South of them. I have shot three birds, all young females, in Cachar, and have seen two specimens from Sylhet. Hume records it from Tippera in 1902, and finally I have received a specimen from Chittagong. But these few instances are scattered over a period of over 25 years and merely emphasize the fact of their great rarity, South of the Brahmapootra Valley.

As Col. Graham gave such a detailed account of the numbers in which the Florican was to be found in former times in each Assam district, it may be as well here to give also an idea as to how they are now distributed. Col. Graham writes: "The Bengal Florican may be said to extend throughout the Assam Valley, from the Manas River, on the West, to the Mishmi Hills, East of Sadiya, on the East.

"It is found in greatest numbers in high and dry open lands, the places most frequented by it being the large Bishnath plain and the higher lands lying between the Government Trunk Road on the North of Brahmapootra, and the hills throughout the Darrang districts.

"North of Mangaldai, in Darrang, about five miles from the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Bhutan Hills, at a staging bungalow, well named Shikar, I shot fourteen Florican in one day.

"The Florican is also found on the Sadiya plains in fair numbers, and on the chars of the Brahmapootras, but it is much scarcer on the South bank of that river.

"On the Bishnath plain and other places in the Darrang district I have seen, I am sure, from 30 to 40 Florican in a day.

"Taking Assam, as a whole, I should say of the Florican:

"In Darrang, very common.

"In Kamrup and Goalpara, a good sprinkling.

"In Nowgong, Sibsagar, Lakhimpur, here and there a fair sprinkling, but, as a rule, scarce."

At the present day the Florican is still plentiful in the Goalpara district on the North bank, breeding in great numbers in the sun-grass lands at the foot of the Bhutan Hills; from this district it extends through Kamrup, Mangaldai, Darrang and Sibsagar. North of the Brahmapootra in considerable numbers wherever there are the necessary plains of grass to be found. In North Lakhimpur it becomes less common, though it will be found, as already mentioned, right up to the foot of the Abor, Mishmi and Dafla Hills, East and North of Sadiya. South of the Brahmapootra River, though it is common in parts of Nowgong, it is elsewhere rare. In Lakhimpur and Sibsagar a fair number are shot annually south of the River, but in Kamrup and Goalpara it is decidedly rare on that bank of the Brahmapootra and it hardly ever straggles to the district of Mymensingh, which adjoins the latter, though it is common in parts of the Rangpur district to the North of the River. I should, however, note that Farren recorded it as occurring not infrequently along the borders of the Madhapore jungle in 1880.

Both in Maldah and Purnea, where 25 years ago it was common, it has now become much less so, principally owing to the spread of cultivation and the consequent destruction of its favourite haunts. In Nuddea it is not now heard of and the last killed there was by myself, this too a female, in January 1884.

In Behar it only occurs as a very rare straggler. Inglis, who has worked this part of India very thoroughly, only records five instances of its occurrence, and, of these, two concern the same bird.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The favourite haunts of the Florican are thus well described by Hodgson, who says : "Tarai is an Indian term equivalent to Pays Bas, Landes, Marches and Marshes, of European tongues ; and the name Tarai is applied, par excellence, to a low-lying moist and rarely redeemed tract of level waste, extending outside the Sal forest along the base of the sub-Himalayas from the debouch of the Ganges to the Brahmapootra. This tract of great extent and peculiar features, is the favourite habitat of the Florican, which avoids the mountains entirely, and almost, if not quite as entirely, the arid and cultivated plains of the Doab, and of the provinces West of the Jumna. It dwells indeed, upon plains exclusively, but never upon nude or cultivated plains. Shelter of nature's furnishing is indispensable to it, and it solely inhabits wide-spreading plains, sufficiently elevated to be free from inundation, and sufficiently moist to yield a pretty copious crop of grasses, but grasses not so thick nor so high as to impede the movements or vision of a well-sized bird that is ever afoot and always sharply on the look-out. Such extensive, well-clad, yet uncultivated plains are, however, to be found only on the left bank of the Ganges and accordingly I believe that to that bank the Florican is nearly confined, and to the Tarai portion thereof."

I am afraid, however, that since Hodgson's days the Florican has become less wise, for he now-a-days often haunts grass land that is liable to inundation and indeed, throughout the cold weather, he is found on the plains bordering the rivers and on the islands in them, although during the rains these may form one vast sheet of water with the river itself.

The Florican prefers to frequent plains which are covered with thin grass, or thin grass combined with scattered scrub jungle, and much affects those tracts on which village buffalo feed and in which the grass is eaten down to some 18 inches or two feet, with here and there patches of higher grass, and others, again, bare altogether. In the same way they haunt the plains of ekra and grass after these have been burnt and the fresh crop has grown up to a foot or so but is still much mixed with the burnt and withered stems of the previous year's growth. It is only in the height of the rains and when no other cover is available for them that

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

they will ever be found in the dense grass and ekra which at these times may grow to a height of 15 feet, nor will it even then be obtained in such unless there is no other more suitable ground within many miles. Of course, when repeatedly shot at, birds will temporarily take refuge in such cover and sometimes when they are much worried either by sportsmen or village pot hunters they will lie up in heavy cover during the heat of the day, coming out to feed in the mornings and evenings.

Mr. A. Primrose, who was for some years in Goalpara, in writing to me about the Florican says:—"It has a very decided predilection for certain spots, and if you kill the present occupant another is sure to be very shortly found in the same place; one such spot was the grazing ground of the Mornai Tea Estate and on this piece of land I must have accounted for fully a dozen birds and my predecessor for as many more."

"The birds, as a rule, in grass land, lie very close and rise generally well within shot and as they are not what I should call good shot carriers No. 6. shot will be found quite large enough to crumple them up. As a matter of fact I have killed two or three—all females if I remember rightly—with collecting cartridges only loaded with No. 9 or 10 shot. When, however, the bird is found in open or burnt patches it is exceedingly wary and very hard to get right within shot."

"The flight, when well on the wing, while not being rapid, is strong and direct."

I have occasionally shot them when out snipe shooting flushing them from small patches of grass between the rice fields, and No. 8 or 9 shot have always been enough to tumble them over, for though big birds their plumage is soft and lax and affords little protection.

When once flushed they generally fly a good distance, sometimes a mile or so, before alighting and are then difficult to find and to flush again, as they are great runners and move on a long distance before stopping.

Hodgson says:—"The Florican is seldom found in thick cover. When he is, he lies close, so that you may flush him at your foot; but in his ordinary haunts, amid the scattered tufts of more open

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

grass plats he can be neared with difficulty only, and No. 5 shot and a good heavy gun are required to bring him down at 40 to 60 yards distance. His flight is strong with a frequent rapid, even motion of the wings, and if he be at all alarmed, it is seldom suspended under 200 to 300 yards, whilst not unfrequently it is continued so as to carry the bird wholly out of sight and pursuit. When flying the neck is extended before the body, and the legs tucked up under it, whereas the whole family of the Herons fly with neck retracted over the back and legs stretched out behind. The walk of the Florican like that of the Heron, is firm and stately, easy and graceful : he can move afoot with much speed, and is habitually a great pedestrian, seldom using his powerful wings, except to escape from danger, or to go to and from his feeding ground at morn and eve, or to change it when he has exhausted a beat.

" This species is silent and tranquil, and except in the breeding season, seldom utters a sound, but if startled its note is a shrill metallic chik, chik-chik, and the more ordinary note is the same, but softer and somewhat plaintive."

Mr. Primrose endorses this and says that on being flushed it utters a sort of chirrup, but is otherwise silent. I have myself heard them give a sound when flushed, but should have described it rather as a croak than a chirrup: other than this and the curious humming they give when courting I have not heard them make any sound.

They are not gregarious as are most other Bustards, and one bird will seldom be found very close to another.

Col. Macgregor says that he once put up four Florican within a radius of 30 yards, but this is unusual and birds are seldom found within a couple of hundred yards of one another, especially where the jungle is thin and the birds can move about freely. Once when duck shooting I saw two old cock-birds in the open within a few yards of one another, and when I sent a man round to drive them overhead he also put up a hen and my companion and I accounted for all three. Once, also, I shot two hens out of a patch of grass not a hundred yards long, and once or twice I have taken two clutches of eggs laid quite close to one another.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Big bags of Florican are seldom made, though on one occasion a so-called sportsman in Assam shot 64 of these beautiful birds in one day, during the breeding season. There had been very early and very unusually heavy rains and in consequence a vast area of grass covered plain had become temporarily submerged and for miles in every direction there was water varying in depth from a few inches to two or three feet deep. In the centre of this was a somewhat raised strip, and here all the birds from far and near had collected. The sportsman (?) walked from one end to another, bagged a dozen Florican and then when the birds had again returned and settled on the dry land, walked back and killed a lot more and this he continued to do until darkness drove him home.

Mr. Anley, writing of the Dooars, said, that he had seen as many as twenty in a morning and Mr. Damant recorded that bags of eight or ten could often be bagged in a morning at the foot of the Garo Hills.

Col. Comber also says that in many places they are common enough in Assam for ten or more to be killed in a day's shoot.

With a line of elephants there are still many places where one could pick up a dozen birds or so in a day, but shooting on foot is laborious work, for much ground has to be covered and the grass and jungle make the walking hard. Under the latter circumstances a bag of more than four or five would be good now-a-days for a single gun to get in a day's work.

It is not often, however, that a sportsman sets out to make a bag of Florican; many are killed by men out making a miscellaneous bag, but perhaps even more are killed by sportsmen on elephants returning from a day's big game shooting.

The breeding season of the Florican commences in March and extends into June, but the majority of eggs are laid in the first fortnight of April or in the last week of March.

The cock Florican, like all the rest of his family, goes in for all sorts of curious antics during the breeding season. Hodgson, as quoted by Hume, writes: "The Florican is neither polygamous nor monogamous nor migratory nor solitary. These birds dwell permanently and always breed in the districts they frequent, and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

they dwell also socially but with a rigorous separation of the sexes, such as I fancy is paralleled in no other species. Four to eight are always found in the same vicinity, though seldom very close together, and the males are invariably and entirely apart from the females after they have grown up. Even in the season of love, the intercourse of the sexes amongst adults is quite transitory, and is conducted without any of that jealousy and pugnacity which so eminently distinguish most birds at that period.

"In the season of love, the troops of males and females come into the same neighbourhood, but without mixing. A male that is amorously disposed steps forth, and by a variety of very singular proceedings, quite analogous to human singing and dancing, recommends himself to the neighbouring bevy of females. He rises perpendicularly in the air, humming in a deep peculiar tone and flapping his wings. He lets himself sink after he has risen some fifteen or twenty yards; and again he rises and again falls in the same manner, and with the same strange utterance and thus perhaps five or six times, when one of the females steps forward and with her he commences a courtship in the manner of a Turkey cock, by trailing his wings and raising and spreading his tail, humming all the time as before.

"When thus, with what I must call song and dance, the rites of Hymen have been duly performed, the male retires to his company and the female to hers; nor is there any appearance (I have at some cost had the birds watched most closely) of further or more enduring intimacy between the sexes than that just recorded, nor any evidence that the male ever lends his aid to the female in the tasks of incubation and rearing the young.

"The procreative instinct having been satisfied, the female retires into deep grass cover, and there, at the root of a thick tuft of grass, with very little semblance of a nest, she deposits two eggs, never more or less, unless the first be destroyed. If the eggs be handled in her absence, she is sure to discover it and to destroy them herself. The eggs are of a size and shape of an ordinary domestic fowl's but one generally larger and more richly coloured than the other.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"The female sits on her eggs about a month, and the young can follow her very soon after they chip the egg. In a month they are able to fly; and they remain with the mother for nearly a year, or till the procreative impulse again is felt by her, when she drives off the long since fully grown young. Two females commonly breed near each other whether for company or mutual aid and help; and thus the coveys,—so to speak, though they are not literally such,—are usually found to consist of four to six birds. The Florican breeds but once a year in June, July, that is, the eggs are then laid, and the young hatched in July, August."

Capt. C. B. Macgregor also describes their dance as follows: "In June and July and sometimes as late as August, I have repeatedly witnessed the performance of the nuptial dance by the cock-bird in full plumage. The bird rises from the ground and hovers with extended wings from 10 to 20 feet in the air, and thus attracts the female birds who may be within an easy distance. Twice I have noticed this dance in the evening after the sun has gone down when returning from shooting under the Daphla Hills. The Florican generally breeds in the higher plateaux of the Assam Valley, near the foot of the hills. The males have been seen also by Major Cock in full plumage in the month of May."

Mr. Primrose, also, in writing to me remarks: "The male bird makes itself very conspicuous during the breeding season from its habit of rising a few feet into the air above the grass and, after hovering a few seconds with quivering wings, again dropping to earth. Whilst thus employed the birds are so taken up with their performance that they are very easily approached and the native pot hunters take full advantage of them at this season."

The first clutch of eggs I ever took with my own hands was found for me by a Mikir, and shown to me on the 3rd June 1904. These two eggs were laid in a bare patch in an extensive field of sun-grass close to a village, the cattle and buffaloes from which had regularly fed over it. In consequence, the grass was neither very high nor very dense and was intersected in every direction by small paths, worn by the animals as they fed. These were taken at Sadiya in the Dibrugarh District and I heard of two other

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

clutches being found by sportsmen in that district, one in March and the other in July.

In 1906 and the following years I employed a large number of men to work the Terai land at the foot of the Himalayas in the Goalpara and Mangaldai Districts and succeeded eventually in obtaining a very fine series of their eggs and in all over 60 have now passed through my hands.

The result of this work shows beyond all doubt that the normal breeding season of the Florican is much earlier than has hitherto been thought to be the case. The months in which the vast majority of eggs are laid are March and April and it may be said that the height of the laying season is from the 10th March to the 15th April. Some few birds will, however, be found to be laying in May and yet a few others as late as June, but in this latter case I fancy the clutches are second layings in place of others which have been taken or destroyed.

Messrs. Shillingford, Whymper and others have certainly taken their eggs in June, and the latter assures me that he believes that June is the normal laying month for Florican in the north-western Nepal Terai. All these people have however taken but a casual nest here and there, and I still consider the weight of evidence points to the Florican being an early breeder.

The following are the dates on which I have taken, or had taken, Florican's eggs:—

28th	February,	Two eggs, quite fresh.
3rd	March	One egg do.
6th	,,	Two eggs do.
7th	,,	Two pairs of eggs, fresh.
14th	,,	One pair, slightly incubated.
16th	,,	One egg, hard set (about 20 days).
19th	,,	Two pairs, one fresh, one hard set.
24th	,,	Two pairs, both fresh.
25th	,,	One pair, fresh.
29th	,,	Three pairs, two slightly incubated, one fresh.
30th	,,	One pair, slightly incubated.
3rd	April,	One pair, fresh.
5th	,,	One pair, fresh.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

7th	April,	Two pairs, one slightly, the other much incubated.
9th	,,	Two pairs, both considerably incubated.
10th	,,	One pair, fresh.
11th	,,	One pair, incubated.
13th	,,	Three pairs, one considerably, the other two slightly incubated.
16th	,,	Two pairs, hard set.
19th	,,	One pair, would have hatched in three days or so.
23rd	,,	A single egg, much incubated.
27th	,,	Two pairs, slightly incubated.
29th	,,	A single egg, fresh.
30th	,,	A single egg, almost fresh.
5th	May,	A pair, fresh.
13th	,,	A pair, hard set.
14th	,,	A pair, hard set.
20th	,,	Two pairs, one slightly, the other considerably incubated.
25th	,,	A single egg, hard set.
31st	,,	One pair, hard set.
3rd	June,	One pair, fresh.
5th	,,	One pair, fresh.
16th	,,	Two pairs, fresh.
24th	,,	One pair, not taken away.
3rd	July,	Four eggs, close together, not taken.

Thus, of the 79 eggs recorded it will be seen that they were found as follows:—

In February,	2.
,, March,	22.
,, April,	31.
,, May,	13.
,, June,	8.
,, July,	4.

The four eggs seen in July were in some grass land which had been flooded and were actually under water when found, so that they must have been laid some time in the middle of June at latest. The gentleman who found them was after tiger at the time and did not remove them.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

In every case the eggs had been laid on the ground in small bare patches in the centre of fields of sungrass, or *uloo* grass, these being generally of considerable extent, seldom near any village or habitation, and most often surrounded by dense forests or cane jungle.

The eggs are exceptionally difficult to find owing both to the great extent of country one has to cover and to the natural cuteness of the hen bird. Unless taken absolutely unawares by the searcher she never rises direct from her nesting place when disturbed but creeps through the grass until she has got a considerable distance from it, after which she rises and flies straight away. Thus, one can never hope to find the eggs within fifty yards of where she is flushed and often they may be 200 yards from this spot. She exhibits the same care in approaching her eggs, alighting a hundred yards away and walking through the jungle up to them. Fortunately, the bird when disturbed, generally makes off in a bee line from the object disturbing her so that the egg collector, marking the spot whence she rises generally finds the eggs by working back in a straight line towards the direction whence he has come.

An Indian friend who was so kind as to look after my collectors for me and to collate notes on their breeding habits wrote to me as follows about the breeding habits of this bustard; "A Florican lays only two eggs a year in the breeding season (April and May). Dense forests infested with ferocious animals, scarcely trodden by men, are the places where eggs are laid on the ground. The bird takes great precaution to conceal her eggs, and you can hardly find any eggs within a quarter of a mile from the place where a Florican is seen. She creeps through the forest unobserved to a great distance to lay her eggs. A very careful and extensive search is required to discover them."

Nest there is none, and the eggs are merely laid in some natural depression under shelter of a tussock of grass. Where there is no such convenient hollow the bird scratches one in the soil or lays them on the ground without taking even this much trouble.

The number laid is almost invariably two, though sometimes a single egg may be incubated. It is practically certain that neither

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

three nor four eggs are ever laid by one bird and the frequent stories recorded to this effect are groundless. It is very noticeable that of the two eggs laid incubation is generally far more advanced in one than the other, and they would appear to be laid at an interval of several days. My own collectors told me that when they found a single egg laid they often waited three to five days before the second was deposited.

Incubation would seem to take about 25-27 days, though this is only guess work. A pair found on the 5th May, and which, when tested in luke warm water, proved to be fresh, were eventually hatched on the 30th of that month and 2nd June, though neither chick survived more than a few hours.

In shape the eggs are typically very regular ovals, the ends being equal. In proportion of length to breadth they vary considerably, but remarkably little otherwise, though a few eggs may be somewhat pointed at one end and in a few other instances at both ends. Curiously enough the extremes of variations are often met with in pairs of eggs laid by the same bird.

In colouration this bird's egg is peculiarly constant, unlike the eggs of *Sypheotis aurita* (the Lesser Florican) which vary very greatly *inter se*. The ground colour is an olive green, in some cases rather brighter, in some rather more brown. The very few exceptions to this ground colour in my collection are one pair with a pale olive green, almost sea green, tint, and another pair with a pale stone grey colour.

The markings consist of small freckles, splashes and blotches, generally longitudinal in character, of brown and purple-brown, rather more profuse at the larger end than elsewhere, but nowhere very numerous. In some eggs these markings are all reduced to freckles, and in these eggs they are often very numerous, very indefinite and often equally distributed over the whole surface. In no eggs are the markings at all bold in character. In a few eggs, not, I think, one in ten, there are a few secondary markings of purple grey or dark lavender grey, but they are very indistinct and, from the colour of the ground, hard to distinguish.

The average of 62 eggs is 2·42″ × 1·76″ (= about 62·5 mm. × 44·8 mm.) and the greatest length and breadth 2·76″ and 1·85′

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(= about 70 mm. × 47 mm.), respectively, and the smallest 2·28″ and 1·67″ (=57·9 mm. × 42·5 mm.).

When fresh the great majority of *Sypheotis bengalensis* eggs are decidedly a bright *greenish* olive-green, but very soon after being blown they become somewhat paler, and in a year or two often lose much of their green tint and become more an olive-brown. The gloss, also, which in newly taken eggs is generally highly developed, pales considerably with time, though some retain it for many years and few lose it altogether.

In my article on the breeding of the Florican which appeared in Volume XVII of this Journal, I commented on the close-time needed for the protection of this bird and then said that it was probable that the time selected should be from the 1st March to the 1st October. This period is especially required for females, but as the male bird is promiscuous in his courtship and takes no interest in the protection of eggs or young, the period for him might be taken from the 1st March to the 1st August.

As a matter of fact, throughout the area this bird inhabits, nature puts a practical closure on all shooting in August and September, and the extension of the shooting-season for males would have no effect. It would be excellent if the shooting of females could be altogether stopped for some years to come, as there is no doubt that the Florican is one of our Game-Birds which is seriously decreasing in numbers of late years.

The Plate of this bird requires little comment. The iris of the male should be deep brown and the upper mandible should have far less yellow or none at all. The plumage of the head and neck is also unusually thick and heavy, though a few birds may have it as dense when just moulted.

The female is excellent, but the spear-shaped centres to the feathers of the back are perhaps a little too definite.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART XIII.

(Continued from page 174 of this Volume.)

30. Platanthera.

Terrestrial, leafy herb. *Flowers* large, in a *raceme* terminating the leafy stem, *sepals* unequal, free, *petals* simple, forming a hood with the dorsal sepal, *lip* continuous with the *column*, produced at the base into a long *spur*, *blade* 3-lobed, *lateral lobes* broad, pectinate, *midlobe* entire, linear, *column* short, without a foot,

ORCHIDS OF THE BOMBAY PRESIDENCY.

The illustration to this article (*Plate XI—Habenaria Susannæ*) appeared at **page 171 of this Volume.**

EDITORS.

spreading, *lateral sepals* $1\frac{1}{2}$ by $\frac{3}{4}$ inch, obliquely subquadrately oblong, obtuse, ascending, *petals* linear acute, $1\frac{1}{4}$ inch long by $\frac{1}{8}$ inch broad, *lip* as long as the sepals, *side lobes* $1\frac{1}{2}$ inch long, truncate, the *outer margins* pectinate to the middle, *midlobe* $1\frac{1}{4}$ by $\frac{1}{4}$ inch, *spur* 4 inches long or twice as long as the *ovary*.

Plants start into growth at the onset of the rains and *flowers* appear from August to October.

Distribution.—Abundant throughout the Konkan, North Kanara and Western Ghats. Also in the hill tracts of Eastern Bengal and Assam, Burma, Western Peninsula and the Malay Islands.

Note.—In the Journal of this Society, Vol. X, p. 328, the late Mr. R. M. Dixon has an interesting note on this plant, to the following effect:—The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(= about 70 mm. × 47 mm.), respectively, and the smallest 2·28″ and 1·67″ (=57·9 mm. × 42·5 mm.).

When fresh the great majority of *Sypheotis bengalensis* eggs are decidedly a bright *greenish* olive-green, but very soon after being blown they become somewhat paler, and in a year or two often lose much of their green tint and become more an olive-brown. The gloss, also, which in newly taken eggs is generally highly developed, pales considerably with time, though some retain it for many years and few lose it altogether.

In my article on the breeding of the Florican which appeared in Volume XVII of this Journal, I commented on the close-time needed for the protection of this bird and then said that it was probable that the time selected should be from the 1st March to the 1st Octob[illegible]

far less yellow or none at all. The plumage of the head and neck is also unusually thick and heavy, though a few birds may have it as dense when just moulted.

The female is excellent, but the spear-shaped centres to the feathers of the back are perhaps a little too definite.

(To be continued.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART XIII.

(Continued from page 174 of this Volume.)

30. Platanthera.

Terrestrial, leafy herb. *Flowers* large, in a *raceme* terminating the leafy stem, *sepals* unequal, free, *petals* simple, forming a hood with the dorsal sepal, *lip* continuous with the *column*, produced at the base into a long *spur*, *blade* 3-lobed, *lateral lobes* broad, pectinate, *midlobe* entire, linear, *column* short, without a foot, *anther* broad and large, *cells* slightly divergent, *pollinia* linear, granular, *caudicles* short, *glands* naked, exserted.

1. PLATANTHERA SUSANNÆ, *Lindl.*; *T. Cooke, Fl. of Bombay, II, p. 712; Dalz. and Gibs., p. 269;* Habenaria Susannæ, *Br. Fl. Br. Ind., VI, p. 137.*

Tubers ovoid, globose, rarely lobed, 3 to 4 inches long. *Stems* robust, 2 to 5 feet high, leafy up to the inflorescence. *Leaves* ovate-oblong or oblong-lanceolate, acute or acuminate, imbricate, the upper sheathing, *blades* (becoming smaller upwards and passing into leafy bracts), 2 to 6 inches long by 1 to 2 inches broad. *Bracts* leafy, $2\frac{1}{2}$ to 3 inches long. *Flowers* in 2 to 6 flowered *racemes*, 3 to 4 inches in diameter, white, fragrant, subsessile, *dorsal sepal*, $1\frac{1}{4}$ inch broad and long, broadly rhomboid spreading, *lateral sepals* $1\frac{1}{2}$ by $\frac{3}{4}$ inch, obliquely subquadrately oblong, obtuse, ascending, *petals* linear acute, $1\frac{1}{4}$ inch long by $\frac{1}{8}$ inch broad, *lip* as long as the sepals, *side lobes* $1\frac{1}{2}$ inch long, truncate, the *outer margins* pectinate to the middle, *midlobe* $1\frac{1}{4}$ by $\frac{1}{4}$ inch, *spur* 4 inches long or twice as long as the *ovary*.

Plants start into growth at the onset of the rains and *flowers* appear from August to October.

Distribution.—Abundant throughout the Konkan, North Kanara and Western Ghats. Also in the hill tracts of Eastern Bengal and Assam, Burma, Western Peninsula and the Malay Islands.

Note.—In the Journal of this Society, Vol. X, p. 328, the late Mr. R. M. Dixon has an interesting note on this plant, to the following effect:—The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

giant Orchis, although commonly reported to be rare and nowhere abundant, is certainly plentiful on the Bhoma Hill at Khandala, from which place the plant does not seem to have been recorded before. After the flowering is over and the fruiting is finished, the plant with the parent root tuber gradually shrivels up and is ultimately withered in December or January, leaving in the ground a healthy, young root-tuber crowned by a well developed bud from which the flower stem shoots up afresh the following season.

The Marathi name of the plant is *Wagh chaora*, meaning the metacarpus of the tiger's foot. Among the Kath-Karis, Thakurs and other Marathi-speaking people living on the Bhor Ghat, the root-tuber of the Giant Orchis is believed to be a sovereign remedy for the cure of blebs or bullæ, specially those occurring on the metacarpus of the palm of the hand. These blebs or bullæ, on account of their supposed resemblance to the raised metacarpus of the tiger's foot are known as *Wagh chaora* in the Deccan. Hence the vernacular name of the plant. There are some persons who believe that the plant is called *Wagh chaora* because the flower looks like the claws or jaws of a tiger.

PLATE XI. The upper part of a plant with the inflorescence. The generic name is given as Habenaria.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

(INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

PART XII.

WITH PLATES I AND J.

(*Continued from page 766 of this Volume.*)

FAMILY—PIERIDÆ.

The members of this family are so subject to variation in the amount of marking on the wings that it is impossible to make a key to the genera without reference to the venation of the wings and other characters which offer difficulties to amateurs.

A. Forewing with all 12 veins present.

a. Male pale blue with black border on upperside, female somewhat like *Danais limniace* in style of marking .. .. *Pareronia.*

b. Male lemon yellow, female sulpher yellow on upperside .. .. *Synchloë.*

B. Forewing with only 10 veins (veins 8 and 9 absent).

a. Of small size: 1″ to 2″; underside hindwing with no red terminal border .. .. *Leptosia.* (Fig. 15.)

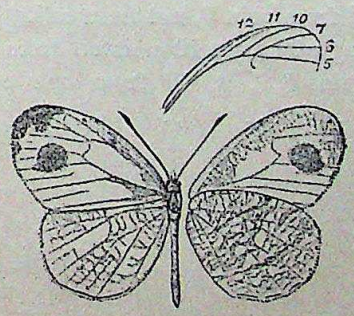


Fig. 15.

b. Larger: 2″·6 to 3″·3; underside with red terminal border to hindwing .. .. *Delias.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

C. Forewing with 11 veins (only vein 8 absent).

a. Costa serrated. Hindwing underside with orange-red terminal border .. .. .. *Prioneris.* (Fig. 16)

b. Costa not serrated. Hindwing underside with no red terminal border.

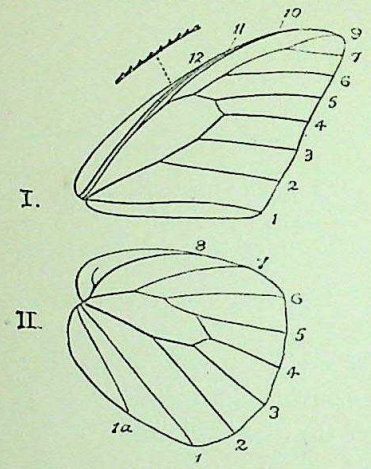


Fig. 16.

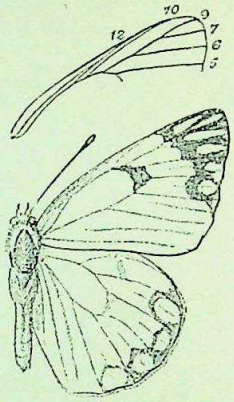


Fig. 17.

a^1. Forewing with vein 11 anastomosing with vein 12 .. .. *Anaphœis.* (Fig. 17.)

b^1. Forewing with vein 11 not anastomosing with vein 12 (both veins free).

a^2. Forewing with vein 6 not stalked with vein 7; size less than 2″·25 .. .. *Colotis.* (Fig. 18.)

b^2. Forewing with vein 6 not stalked with vein 7; size 3″·75 to 4″ .. .. *Hebomoia.*

c^2. Forewing with vein 6 stalked with vein 7, *i.e.*, emitted from vein 7, not from cell.

a^3. Forewing with vein 10 emitted from vein 7, *i.e.*, veins 6, 7, 9, 10 from one common stalk .. .. *Colias.* (Fig. 19.)

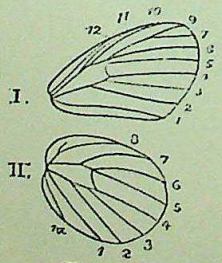


Fig. 18.

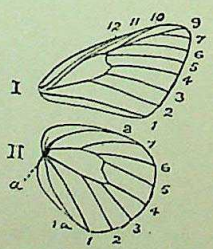


Fig. 19.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

b^3. Forewing with vein 10 emitted from subcostal vein, not stalked with 6, 7, 9.

a^4. Hindwing without a precostal vein .. *Terias.*

b^4. Hindwing with a precostal vein.

a^5. Forewing with vein 11 emitted from the subcostal nervure half-way between base and apex of the cell .. *Catopsilia.* (Fig. 20.)

b^5. Forewing with vein 11 emitted from subcostal nervure nearer apex than base.

a^6. Forewing with vein 9 very short, given off so near the outer margin of wing as to be nearly absent sometimes .. .. *Pieris.* (Fig. 21.)

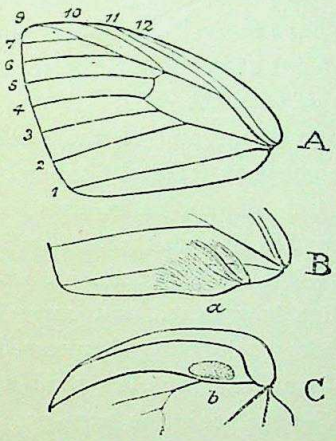


Fig. 20.

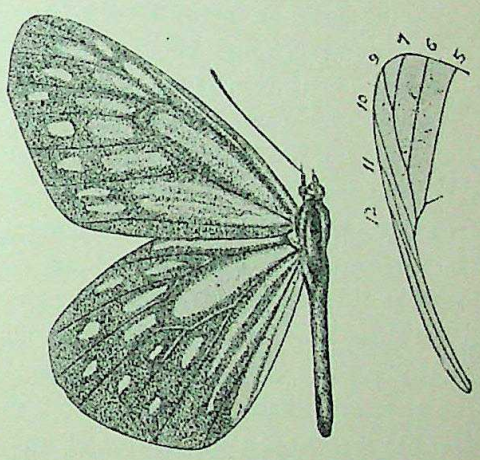


Fig. 21.

b^6. Forewing with vein 9 longer, always given off well before margin of wing.

a^7. Male without specialized tufts of stiff hairs on anal segment at base of clasper ventrally, easily discernible .. .. .. *Appias.* (Fig. 22.)

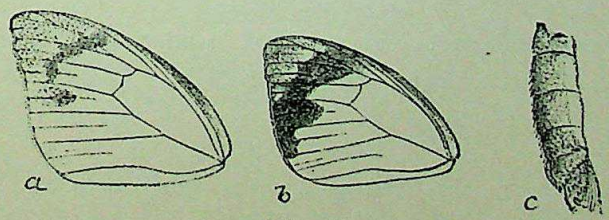


Fig. 22.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

b[5]. Male without any such tufts ventrally at base of claspers.

a[6]. Forewing upperside white and black without white apical band defined by black and without any orange colour .. *Huphina*. (Pl. I, figs. 61, 61*a*.)

b[6]. Forewing upperside white and black but with white or orange subapical band defined by black (mostly orange).. .. *Ixias*. (Pl. I, fig. 62.)

As said before, these vein characters will not be always ascertainable without some slight vexation; but, with the help of a good lens and a little benzine or spirits of wine, none of them should offer any serious obstacle to running down an insect. The best way to count the veins is round the edge of the wing, vein 2 being a good starting point as it is the first given off from the cell; vein 11 is the last vein given off from the cell.

The larvæ of nearly all the *Pieridæ* are green in colour and of the same type, some few are somewhat hairy, most are somewhat minutely tuberculate; the pupæ are somewhat varied in shape, but all can be referred to three types at the most: one, the normal, suspended like that of a *Papilio* with a nose-point and the ventral line of wings but little prominent, another like this but with the nose-point somewhat lengthened and curved, the wing outline ventrally very prominent, the whole pupa compressed laterally, a third suspended by tail and body-band also, but the band so tight as to press the pupa against the suspension surface: the nose-point somewhat lengthened and upturned, the dorsum flattened behind thorax and laterally produced into a couple of teeth. The three forms of pupa are characteristic of *Catopsilia*, *Pareronia* and *Anaphæis* respectively.

Genus Leptosia.

Only one species. Size 1″ to 2″ .. .. *xiphia*. (Pl. I, fig. 58.)

A weak, white, fragile-looking butterfly, found everywhere, even in Sind, keeping to the shady underwood. It has a large black spot on outer area of forewing. Larva and pupa normal; foodplant *Capers*.

Genus Delias.

A. Hindwing underside: red marginal band margined inwardly with black. Size: 3″ to 3″·30 .. .. *eucharis*. (Pl. I, fig. 59 ♂, 59*a* ♀.)

B. Hindwing underside: red band not margined inwardly with black. Size: 2″·6 to 3″·3 .. .. .. *hierta*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

These insects are weak fliers and are very common; they are easily distinguishable by the red marginal band on underside of hindwing. The larvæ of *eucharis* are gregarious, feed on *mistletoe* and are greasy looking, olive-brown in colour with longish white hairs, 6 or so to each segment. Pupa oily greenish yellow with black markings.

Genus PRIONERIS.

Only one species. Size: 3″·40 to 3″·50 .. .. .. *sita.*

Certainly not a Plains butterfly; confined to the hills altogether; but has been mentioned here as it is so extraordinarily like *Delias*. It is, however, a very strong flier. Larva feeds on *Capers*.

Genus ANAPHÆIS.

Only one species. Size: 1″·75 to 2″·5 .. .. .. *mesentina.* (Pl. I, fig. 60.)

Altogether a butterfly of the Plains and one of the commonest. Larvæ gregarious, green, with purplish bands on each side; somewhat hairy. Pupa abnormal as stated above. Foodplant *Capers*.

Genus PIERIS.

A. Hindwing underside: markings green. Size: 1″·6 to 2″ .. .. *glauconome.*

B. Hindwing underside: not green.

a. Forewing upperside: inner margin of apical black area evenly curved. Size: 2″·5 to 3″ .. .. *brassicæ.*

b. Forewing upperside: inner margin of black apical area sinuous or scalloped. Size: 1″·6 to 2″·3 .. *canidia.*

This genus is not of the Plains at all; it is confined to the higher hills in the Himalayas and Nilgiris (*canidia*). *Glauconome* has been taken at Karachi in Sind several times, does not occur further south seemingly, but is plentiful in the hills of the North-West. *Brassicæ* is recorded from Lucknow and Umballa in North India, but only as a straggler; it is a Himalayan butterfly; also European. *Canidia* is said to have been taken in Lucknow which is the only record of its appearance in the plain country.

The larvæ of the genus are quite normal, the pupæ are of the type of those of *Anaphæis*. The foodplants are *Cruciferæ*: cabbage and such like plants.

The character of *a* and *b* is not well marked in the females of the species concerned.

Genus SYNCHLOE.

Only one species. Size: 1″·3 to 1″·66 .. .. .. *lucilla.*

Genus HUPHINA.

Only one species. Size: 2″ to 3″ .. .. *nerissa.* (Pl. I. figs. 61 ♂, 61*a* ♀.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A very common insect, found almost everywhere and a fast, strong flier; somewhat variable according to season and locality.

Larva normal, green; pupa of the *Anaphæis* type. Foodplant *Capers*.

Genus Ixias.

A. Upperside: ground-colour clear gamboge-yellow. Size: 1″·70 to 2″·50 .. .. *pyrene*. (Pl. J. figs. 65 ♂, 65*a* ♀♀.)

B. Upperside: ground-colour white.

a. Forewing upperside: preapical orange patch extended into apex of cell. Size: 2″·1 to 2″·6 .. *marianne*. (Pl. J. fig. 62.)

b. Forewing upperside: preapical orange patch not extended into cell. Size: 2″· to 2″·2 .. .. *nola*.

These are "Orange-tips." *Nola* is probably only a variety or local race of *marianne* as the character of extension of the orange patch is not a good one; it is only found at Mahableshwar on the Western Ghats. The ground-colour of *pyrene* female may be almost white, though never pure white, and may have no orange patch though the black border defining that patch is always present.

Larva green; pupa of the *Anaphæis* type. Foodplant *Capers*.

Genus Appias.

This is an extremely difficult group to disentangle as the individuals vary so much with the season and locality in the amount of markings on the wings; some specimens, indeed, of one species which is normally white may be suffused strongly on the underside with yellow or orange. The forewing of the male is nearly always rather narrow and pointed.

A. Forewing: veins 5 and 7 approximate at bases and, therefore, the top discocellular vein missing; the upper discocellular (veinlet uniting veins 5 and 6) less than half the length of the lower discocellular veinlet (uniting veins 4 and 5).

a. Male forewing underside: discal black band narrow; hindwing not richly coloured underneath in wet-season form. Size: 2″ to 3″ .. .. .. *indra*.

b. Male underside forewing: discal black band broad; hindwing underneath richly coloured in wet-season form. Size: 2″·3 to 2″·75 .. .. *narendra*.

B. Forewing: veins 5 and 7 approximate at bases; top discocellular more than half length of lower discocellular.

a. Upperside forewing: outer black margin or area not produced inwardly in interspace 3.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a^1. Hindwing underside: with terminal black band; male underside forewing: a prominent white or yellow subapical spot. Size: 2″·5 to 3″ .. *hippo.*

b^1. Hindwing underside: with no terminal band and, in the male forewing underside: no apical white or yellow spot.

a^2. Male underside: pure white in wet-season form, tinged with ochraceous in dry-season form.

a^3. Male underside hindwing: immaculate at all seasons. Size: 2″·1 to 2″·6 .. .. *libythea.*

b^3. Male underside hindwing: veins more or less broadly black, white only in extreme dry-season form. Size: 2″·1 to 2″·7 .. *zelmira.*

b^2. Male underside hindwing: yellow or ochraceous at all seasons. Size: 2″·38 to 2″·94 .. *albina.*

b. Upperside forewing in the male: outer black margin produced inwardly into interspace 3 (except in dry-season form of *leis*).

a^1. Male underside forewing: oblique, curved black band on outer half terminated on vein 2, sometimes reduced to a mere black spot in interspace 3. Size: 1″·9 to 2″·6. .. .. *leis.*

b^1. Male underside forewing: oblique, curved black band on outer half extended to tornal angle or altogether absent. Size: 2″ ·55 to 3″ .. *wardi.*

The larvæ of all these are very like each other, fairly normal in aspect; the pupæ are of the *Anaphœis* type. Foodplant *Capers.*

Genus CATOPSILIA.

A. Underside: without irroration of transverse reddish-brown striæ. Size: 1″·8 to 3″·4 .. .. .. *crocale.* (Pl. L., figs. 72 ♂, 72*a* ♀♀ of form *catilla*; 73 ♂, 73*ab* ♀♀ of *crocale.*)

B. Underside: with such irroration. Size: 2″ to 2″·75. *pyranthe.* (Pl. J. figs. 64 ♂, 64*a* ♀.)

The first species is very liable to variation in the amount of black on the upperside in the females; the males are very constant.

Very common butterflies; fast fliers.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Larvæ and pupæ altogether normal. Foodplants: *Leguminoseæ*; nearly confined to the genus *Cassia*.

Genus Colias.

Only one species, said to have been obtained at Lucknow.

Size: 2″ to 2″·5 .. .. *fieldii*.

A Himalayan species, visiting the Plains only as a straggler.

Genus Terias.

A. Forewing underside: cell unmarked.

a. Male with secondary sexual characters on both wings; both sexes with dark line on discocellulars of underside of forewing.

*a*¹. Forewing: apex rounded. Size: 1″·4 to 1″·7 .. *venata*. (Pl. K., fig. 70, 70*a*, 70*b*, 70*c*.)

*b*¹. Forewing: apex acute. Size 1″·4 to 1″·9 .. *læta*. (Pl. K., fig. 69, 69*a*.)

Venata has the black margin of forewing reaching tornus, *læta* has it stopping before it.

b. Male with no secondary sexual characters; both sexes with two dots on discocellulars on underside of forewing. Size: 1″·25 to 1″·75 .. .. *libythea*.

B. Forewing underside: two marks in basal half of cell. Size: 1″·60 to 2″·20 .. .. *hecabe*. (Pl. K., figs. 71,71 *a*, *b*, *c*, all forms.)

C. Forewing underside: three marks in cell. Size: 1″·60 to 2″·10.. .. .. *silhetana*.

Venata is often difficult to distinguish from *libythea* as the marks may be obsolete; at least the females are: for the males can be told at once by presence or absence of sex-marks; however *venata* is often powdered with blackish scales on upperside. *Læta* is unmistakeable from the shape of the wing and the bar-marking, as also the colour on the underside of hind-wing.

The larvæ and pupæ are normal, *i.e.*, this is known of all except *T. læta* which has never been bred; and this species is remarkable as being very plentiful in the dry season, nearly completely absent during the monsoon months. Foodplants: *Leguminoseæ*; genus *Cassia*, &c.

All the species are some shade of sulphur-yellow with black borders to the wings.

Genus Colotis.

A. Upperside: ground-colour salmon-pink; female sometimes with ground-colour white.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a. Upperside: sometimes white in the female. Terminal black band on hindwing narrow with a more or less obsolescent series of spots of the same tint as ground-colour so arranged as to break up the inner edge of band. Size: 1″·5 to 2″ .. *amata.* (Pl. J., fig. 68.)

b. Upperside: always salmon-pink. Terminal black band on hindwing broad and immaculate. Size: 1″·5 to 2″ .. .. *protractus.*

B. Upperside forewing: salmon-pink, of hindwing white, of female sometimes both wings white. Terminal black band of hindwing broad. Size: 1″·5 to 1″·8. .. .. *phisadia.*

This species is like *protractus* except that the spots on the apical band of forewing are of the ground-colour and not suffused with grey as in that species.

C. Upperside: ground-colour of both wings orange-pink; female sometimes with ground-colour white or white suffused with salmon-buff.

a. Upperside forewing: four or five spots of ground-colour enclosed in terminal black border. Size: 1·″8 to 2″·25 .. .. *fausta.*

b. Upperside forewing: never more than three spots included in the black border. Size: 1″·8 to 2″·25 .. .. *tripuncta.*

Fausta is found in Sind, Panjab, Rajputana, Bombay; *tripuncta* in Sind, Bombay, Poona, Nilgiris, Bengal, Orissa, Ganjam.

D. Upperside: ground-colour white.

a. Upperside forewing: no orange or carmine markings, a broad, black, terminal immaculate band. Size: 1″·5 to 2″ .. .. *vestalis.*

b. Upperside forewing: orange or carmine apical patch present.

a[1]. Upperside forewing: apical patch orange.

a[2]. Forewing upperside: the orange patch not bordered with black on inner side. Size: 1″·4 to 2″ .. .. *eucharis.*

b[2]. Forewing upperside: orange patch bordered on inner side with black. Size: 1″·2 to 1″·75 *etrida.* (Pl. J., figs. 67, ♂ 67*a* ♀.)

b[1]. Upperside forewing: apical patch crimson. Size: 1″·5 to 1″·75 .. .. *danaë.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

These last three are the small "Orange-tips." None of the genus are found in jungle countries nor in the hills proper. They are all butterflies of the Plains, though *amata* occurs in the Konkan.

The larvæ of all that have been bred are normal as well as the pupæ; except the pupa of *C. eucharis* which has the ventral line of wings very convex in the manner of *Pareronia*. *C. amata, protractus, phisadia* and *vestalis* are divided from the others by the fact that they feed upon *Salvadora persica* of the Family *Salvadoraceæ*; the others feed upon *Capparis*. *Salvadora persica* is the "Mustard Tree" of Scripture. There is another species also, *Salvadora oleoides*, in Sind upon which larvæ are occasionally found.

Genus Hebomoia.

Only one species. Size: 3″·75 to 4″ .. .. .. *glaucippe*. (Pl. J., figs. 66 ♂, 66*a* ♀.)

This is the Large Orange-tip, a very powerful, fast flying insect, not uncommon along the Western Ghats and in the Konkan.

The larva is not quite normal, green in colour; the pupa is of normal shape, also green. Foodplant: *Capers*, especially *Capparis moonii* and *Cratæva religiosa*.

Genus Pareronia.

A. Male: forewing upperside: terminal black border narrow, traversed by a more or less complete subterminal series of bluish-white spots; female is somewhat like *Danais aglea* and has sometimes the base of the wings yellow; the eyes of both sexes are generally green. Size: 2″·75 to 3″·5 .. .. *hippia*. (Pl. J., figs. 63 ♂, 63*a* ♀.)

B. Male: forewing upperside: terminal black border broad with no light spots or only a slight trace or one or two, female like the last but never with yellow at base of wings. Size: 3″ to 3″·4.. .. *pingasa*.

Hippia is common and really the only one that occurs in the Plains; the other may be found along the borders, more probably in the Hill Stations of Matheran and Mahableshwar in the Western Ghats. It is generally possible to distinguish *hippia* from *pingasa* by the more or less nacreous (like mother-of-pearl) lustre of the underside in the former, especially on the hindwing, as well as by its lighter blue colour.

The larvæ are nearly normal, the pupæ are much compressed laterally, have long, curved beaks and the ventral wing-outline very prominent. The foodplants are *Capers*.

The *Pieridæ* as a family are characterized by "six well developed legs,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the same in both sexes, no pad on front tibiæ. Claws bifid or toothed; an empodium." The members of it are generally popularly known as "whites" because, in the vast majority of the species of the world, the prevailing colour is white. Nearly all species are marked with black to an extent varying generally with the time of year; in the tropics this means with the period of young shoots rich in moisture and juices or the time when such is not the case.

There are upwards of 1,000 species in the world, Colonel Bingham enumerates 90 as occurring in British India of which number some 42 will be mentioned here. The family is represented in all countries and in all climates from 18,000 feet elevation to sea-level according to species and genera, in the driest regions as well as in districts possessing the heaviest rainfall. More particular information will be given for each genus and species here treated of in its proper place.

Home representatives of the family are the Cabbage Whites, the Clouded Yellows, the Orange-tips, the Brimstone, Bath White, &c. Some of the genera are numerous in species and the latter are often extremely numerous in individuals in India as well as at home, some of the species of *Catopsilia*, *Appias*, *Terias*, *Colotis* extremely so in India. Like the Cabbage White at home *Catopsilia crocale* and *C. pyranthe* as well as *Appias libythea* and *hippo* are veritable pests in certain years, defoliating every foodplant in certain localities to such an extent that millions of the caterpillars die of starvation. The phenomenon is perhaps not as noticeable as at home for the very sufficient reason that the results of a visitation do not affect people in the same way because the trees that the insects feed upon are not of any economic importance to human beings as food. Nonetheless, however, is it a wonderful sight to see millions of larvæ covering the trunks of huge trees, descending from the leafless branches in search of the wherewithal to further their growth. In such numbers they come that, literally, not an inch of bark is visible; often they are packed three deep one on top of the other. A vast number must, of course, die for the odds are against any of this host finding a new tree to ascend; and, even if they did, the probabilities of their finding any leaves on it would be very slight indeed. In such seasons of prolific broods of larvæ the imagines or perfect insects appear in such numbers that, when disturbed from their resting places beneath the leaves in the jungles, they nearly darken the air in yellow clouds (*Catopsilia*). It is easily conceivable that, were these butterflies to remain stationary in any single locality, there would be but small chance for their progeny. They seem to instinctively know this for they migrate in countless numbers to other districts. These migrations have been noticed by travellers in many parts of the world. All fly in one direction to start with and Colonel Bingham says that he has noticed that the flight is against the wind. He remarks that one of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

consequences of the dispersal of individuals thus effected leads to the breaking down of distinctions between local races thus preventing variation in the insects of widely separated districts. These migrating *Pieridæ* are all very strong fliers and some individuals would doubtless go far from their place of origin ; in the course of a few years, probably hundreds of miles.

The prevailing colouring is, as already stated, white, often suffused with some shade of yellow above as well as below, the upperside often with black bordering which is subject to variation in extent and intensity according to the season, sometimes, indeed, affecting very nearly the whole surface in the so-called wet-season broods where the dry-season individuals are lightly marked. In certain genera (*Colotis*) we get species that are salmon-coloured, in others (*Colotis, Hebomoia, Ixias*) the apex of the forewing in some species has an orange or yellow or carmine patch; in *Prioneris* and *Delias* the underside of the hindwing may have a broad red terminal border or basal red spots ; *Pareronia* has in the male some shade of light blue with black veining and border on the upperside ; in *Appias* the underside in certain species is subject to suffusion with deep yellow while *Terias* is always some shade of yellow above and below. Fresh young shoots that appear in the hot weather in India produce large specimens with extensive, intense black markings while the comparatively hard, dry leaves of the cold weather result in smaller and much lighter insects. Now, in the generality of cases, dry, hard leaves mean slow feeding, consequently slow larval growth and large, light specimens; new, tender leaves have the effect of allowing quicker growth, producing smaller, darker individuals. In the *Pieridæ*, seemingly, the rate of growth of the larva is more or less constant whatever the quality of the food available and, therfore, the more food and the easier it is to assimilate, the larger the resulting imagine is. All the larvæ of the family are voracious eaters and feed upon soft-leafed trees and bushes or upon herbaceous plants the young shoots of which are fast growing and very juicy ; the soft leaves admit of the quantity of food being always sufficiently easily assimilable to produce the normal growth and the great softness of the new shoots gives an extra impetus to increasing the size, while their extreme juiciness produces the exuberance of black pigment which is so remarkable in the family. The colouration of the wings is characteristic at all seasons and its style never varies though the extent may ; even on the undersides the style is constant and there is nothing ever to be found of the curious seasonal dimorphism existing in some nympaline and satyrine butterflies. The shapes of the wings are the same at all seasons, also though, perhaps, *Terias læta* has the apex of the forewing more produced in the cold weather.

The larger whites are very strong, fast fliers and progress in the skipping style, in successive undulations, *Hebomoia, Catopsilia* ; *Delias*, however

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

though large, has weak wings and flutters straight ahead. Most of the lesser species fly straight along in the usual way except *Leptosia* which is peculiar in having a slow sailing, deliberate flight of its own. They rest on the undersides of leaves with the wings closed over their backs; *Hebomoia* often rests on the ground with the forewings sunk down between the hinder ones so as to show only the darker parts and is then very difficult to see. They are all fond of the sunlight with the exception of *Pareronia* and *Leptosia* which are insects of the jungles while the others affect more open ground. *Catopsilia* and *Prioneris* often fly high over the tree tops while most of the others keep close to the ground; *Hebomoia* is also often to be seen high up in the air. They all are fond of flowers and *Catopsilia, Appias, Prioneris, Terias* come to moist spots in nallas and on roads in immense numbers during the hot weather.

The egg is cylindrical, narrowed towards the top but very shortly, generally twice as high as broad, with longitudinal ridges some of which join before they reach the top, their ends forming a circle of little teeth or a crown round the micropile, the surface generally finely transverse-lined. The colour is white, generally changing to yellow or orange, sometimes very light with red blotches or rings. They are mostly laid singly on a young shoot, on the edge of a leaf, generally on the upper or lower surface. *Colotis amata* however lays them in batches of 20 to 40, sometimes less, on the undersides of leaves and *Anaphæis mesentina* likewise though, as this insect generally affects *Capparis aphylla* as the foodplant of the larvæ, they are laid on the twigs, there being, as a rule, no leaves.

The larvæ are always without processes of any sort and are generally some shade of green with transverse depressed fine lines, mostly 7 to each segment, each interval between two lines with a row of black or white tubercles, each with a hair growing out of the top; some have a heavy fringe of fine, longish hairs along the sides in the subspiracular region but this is not very common. The head is always round, the anal segment sometimes more or less bifid, the general shape of the body being cylindrical, very slightly thickest in the middle. *Anaphæis mesentina* has a coloured larva with a broad ochreous dorsal band and brown-purple sides. Most of the caterpillars are spotted indistinctly under the skin and have a dorsal or spiracular white band or line, or both. They are not very active, some of them drop from the leaf when disturbed; the great majority rest in the middle of the upperside of a leaf, lying along the midrib on a bed of silk and generally full stretched though some occasionally sit with the front part raised, others with the hinder end in the air. As a rule they eject a sort of green liquid from the mouth when disturbed but do not otherwise possess any visible way of defending themselves. A few turn pink before pupating.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The pupa is of two types, one somewhat resembling a smooth *Papilio chrysalis* with a frontal beak and ventrally bulged wings; the other quite different, having the dorsal middle segments produced horizontally outwards in triangular sharp teeth, the dorsal line of the thorax angled and the head produced into a generally upwards-curved snout. They all have the tail and body-band fixture of the *Papilionidæ*; the former suspending themselves as in that family, the latter angled ones often lying horizontally on the top of a leaf and closely pressed against it, *i.e.*, with a very short body-band. All wriggle when touched, the motion being a side to side one from the segments 9, 10, 11; the junctions of segments 8-9, 9-10, 10-11, being so formed as to permit of this which, by the way, is common to all lepidopterous pupæ. Sometimes this wriggling is accompanied by a slight, dull knocking noise.

The larvæ all eat voraciously, grow fast and the pupal stage is never prolonged. They are often much parisitised by ichneumons and flies, the most unfortunate in this respect being various species of *Terias* and *Colotis*.

The caterpillars offer so few points of difference in shape and colour that a classification of the genera according to them would be rather difficult as the little pattern that exists may be quite absent in species that normally have it quite strongly developed; the size and number of the tubercles is also liable to variation. Another objection is, and it is perhaps the chief one, there is not very much material to go on for there are many of the larval and pupal stages not yet worked out. One large classification on the pupæ is possible, as for example:

Smooth, normal pupæ, suspending themselves like the *Papilionidæ*: Genera *Leptosia, Catopsilia, Ixias, Hebomoia, Terias, Colotis, Pareronia.*

Angulated pupæ, with tail-fixing and close body-band, formed often on the upperside of a leaf or other horizontal position: *Delias, Prioneris, Anaphæis, Appias, Huphina, Colias, Pieris.*

The first group might be further subdivided into two by the shape as follows:—

Normal pupæ with slight ventral wing-bulge and short snout; Genera *Leptosia, Catopsilia, Hebomoia, Terias* and *Colotis* with the exception of *Colotis eucharis.*

Abnormal pupæ with very accentuated ventral wing-bulge, the body laterally compressed and a long curved snout: Genera *Ixias, Pareronia* and *Colotis eucharis.*

Here again, in the first sub-group *Catopsilia* and *Hebomoia* could easily be separated from *Leptosia-Terias-Colotis* and it is possible to separate *Catopsilia* from *Hebomoia* by the shape of the larvæ and their colouration as:

Larva distinctly flanged on the spiracular line, glaucous green in colour,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Explanation of Plate I,

Fig. 58. Leptosia xyphia, ♂

,, 59. Delias eucharis, ♂; 59 a, ♀

,, 60. Anaphæis mesentina, ♂; 60 a, ♀

,, 61. Huphina nerissa, ♂; 61 a, ♀

,, 62. Ixias marianne, ♂

,, 63. Pereronia hippia, ♂

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

swollen about segments 3, 4 with a spiracular line of irridescent tubercles: *Hebomoia*.

Larva normally cylindrical all along, green or yellowish green, a white spiracular band and transverse rows of black tubercles to each segment, those immediately above the spiracular band generally more or less strongly developed forming a black supraspiracular band: *Catopsilia*.

The larva again of *Leptosia* might be separated off from *Terias-Colotis* by the fact that it is smaller and slighter than them; but such classification is useless.

The second group having angulated *chrysalides* may be subdivided to a certain extent as follows:

Larva not green: *Anaphæis, Delias*. And again these may be known:

Larva light brown: *Delias*.

Larva ochreous and purplish brown in longitudinal bands: *Anaphæis*.

Larva green of some shade: *Prioneris, Appias, Huphina, Colias, Pieris* These being insufficiently known it is impossible to further distinguish them at present.

The food-plants of the members of the family are various though all (leaving out *Pieris, Colias, Synchloë*) belong to the *Leguminosæ, Capparideæ, Salvadoraceæ*: *Loranthaceæ, Euphorbiaceæ*, as follows:

Leguminoseæ: Terias, Catopsilia.

Capparideæ: Leptosia, Pareronia, Prioneris, Ixias, Anaphæis, Huphina, Colotis, Appias (except *Appias wardi*).

Loranthaceæ: Delias.

Euphorbiaceæ: Appias wardi.

Salvadoraceæ: Colotis.

Most of the larvæ that feed upon Capers will feed upon any Caper; *Terias* will also feed upon nearly any leguminous plant; *Catopsilia* is nearly confined to the genus *Cassia* but will feed upon most of the species of that genus.

87. Leptosia xiphia.—*Upperside*: white; base of wings very slightly powdered with minute black scales. Forewing: costa speckled obscurely with black, apex black, the inner margin of this inwardly angulate; a very large, somewhat pear-shaped, postdiscal spot also black. Hindwing: white, uniform; in most specimens an obscure, extremely slender, terminal black line. *Underside*: white, costal margin; and apex of forewing broadly, and the whole surface of the hindwing irrorated with transverse, very slender, greenish strigœ and minute dots; these on the hindwing have a tendency to form subbasal, medial and discal, obliquely transverse, obscure bands; forewing: the postdiscal black spot as on the upperside; terminal margins of both fore and hindwings with minute, black, short, transverse, slender lines at the apices of the veins, that have a tendency to coalesce and form a terminal continuous line as on the upperside. Antennæ dark brown

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spotted with white, head slightly brownish, thorax and abdomen white. Female similar, the black markings on the upper side of the fore wing on the whole slightly broader, but not invariably so.

Egg.—Cylindrical, slightly swollen in middle, becoming abruptly narrow at top; 13 longitudinal ridges of triangular section of which only six reach the top where their ends, as minute teeth, surround the flat end. Colour blue. H: 1·2mm.; B: 0·5mm.

Larva.—Head round, with very prominent, shiny, black eyes, covered with black, short, stiff, semi-appressed bristles; smaller than segment 2; colour green. Body cylindrical, broadest at segments 4, 5 and 6, thinning off suddenly at segment 13. Anal segment narrow, square at end with a colourless, curved, straight hair from each corner pointing backwards, rising from a cylindrical, white tubercle. The whole length of the body is lined transversly by depressed lines at equal distances from each other; between these lines are rows of black, erect, short bristles surrounded at their bases by a circular, green mark; there is a single row between each two lines; interspersed among these bristles are a few white, cylindrical tubercles bearing each an erect, white, longish hair generally carrying at its tip a drop of amber-coloured, transparent liquid; these long hairs are most numerous on segments 2, 12 and 13. Ventrum also haired at sides. Spiracles nearly oval, very small and difficult to distinguish. Colour grey-green with an indistinct, supraspiracular, dark line, below which is a whitish spiracular line; a darkish dorsal line. L.: 17mm; B: 2·5mm.

Pupa.—Head small, eyes nearly hidden by the broad base of the short, conical beak. The pupa is of the type of *Terias hecabe.* It is slight and delicate-looking. Segment 2 broad and waved as to hinder and front margins, flattish on top. Thorax short, humped, very slightly carinated, as well as segment 2, dorsally. Sides from shoulders to segment 8 parallel. Part made up of head and segment 2 parallel-sided and narrower than shoulders. Section of abdomen from segment 9 to end circular. Constriction at segment laterally wide and slight, dorsally ordinary. Cremaster stout, square, with a dorsal depression near hinder margin. Apex of thoracic (ventral) expansion of wing cases, which is parabolic, opposite segment 7. Spiracles oval, light ordinary in size. No spiracle of segment 2 visible. Surface glabrous, very minutely transversely striated, shiny. Colour very transparent green, often suffused with pink; a dorsal and lateral brown line the whole length of pupa, covered with pink-brown spots obsolescently and sparsely; a lateral row of black spots on segments 3 to 12, those on segment 5 exuding a black or white liquid which dries like gum; there is one spot laterally to each segment; beak yellow with a ring of 7 black spots half way up. L: 13·6 mm.; B: 3 mm. H. at apex of wing-bulge: 4·4mm.

Habits.—The egg is laid on the underside of a leaf near the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ground, generally on a young leaf; the larva lives on the underside as a very general rule, but may be found on the upperside also; it has the slow-moving habits of the larvæ of the family and does not wander far to pupate. The pupa is attached to the underside of a leaf, the tail-pad is fairly thick and the attachment therefore strong, the body band is fairly loose. The growth of the larva is fast and the duration of the pupal stage about a week. The butterfly is the weakest flier of the whole family; a flimsy little thing that never rises more than a foot or so from the ground and may at all times be found in the undergrowth, fluttering along weakly, with the wings held horizontally, open for longer intervals than is usual with any other member. Notwithstanding its small size, it is a conspicuous little insect when flying because of its pure white colour, with the single large black spot; when at rest it closes the wings, sinks the upper into the hindwings and becomes nearly invisible from the protective marking of greenish strigæ and lines which cover the underparts that remain exposed; it sits generally on the underside of a leaf or on a thin perpendicular plant-stem or dead stick. The food-plants of its larva are Capers of probably all species except the absolutely herbaceous ones. It has been actually bred upon *Capparis heyeana* and *Cratœva religiosa* in Kanara. The distribution according to Colonel Bingham is "the lower Ranges of the Himalayas from Mussoorie to Sikkim; Central, Western and Southern India *but not in the desert tracts*; Ceylon; Assam; Burma and Tenasserim; extending to China and the Malayan Subregion." What is meant here by the "desert tract" is not exactly known. If Sind is included in the term, then the statement is wrong (the italics are not Colonel Bingham's) for the insect has been seen often in the neighbourhood of Karachi and in other parts of that country; it is not uncommon in Gadag and Bijapur of the Bombay Presidency. The probability is that it exists anywhere there are opportunities for the food-plants to grow. The little butterfly is not subject to much seasonal variation; it only affects the tone of the green on the underside and, to a very limited extent, the size of the black markings on the upperside as also their intensity.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

88. Delias hierta.—male and female closely resemble *D. eucharis*, but can be distinguished as follows :—male *upperside* : fore wing : the black margins to the veins more diffuse ; the transverse, postdiscal fascia diffuse, ill-defined, oblique, not parallel to termen in its lower portion but terminated at apex of vein 2 ; the apical portion of the wing beyond the fascia more or less so thickly shaded with black scales as to leave the white lanceolate spaces between the veins (so prominent in *eucharis*) ill-defined and obscure. Hind wing white, the black venation and terminal narrows, black border as well as the subterminal vermilion-red spots between the veins on the underside show through by transparency. *Underside* : fore wing as in *eucharis*, but the back margins to the veins much broader and the postdiscal, transverse fascia as on the upperside, oblique but broader. Hind wing differs from that of *eucharis* in the much deeper chrome-yellow tint of the ground-colour, the postdiscal, black, curved fascia that in *eucharis* separates the yellow from the subterminal vermilion-red spots entirely wanting, the red spots themselves pointed inwardly, not subcordate, they conspicuously increase in size posteriorly. Antennæ, head, thorax and abdomen similar to those of *eucharis*. Female differs from the female of *eucharis* on the upper-side by the very much darker shading, especially on the forewing and by the postdiscal, transverse band which is as in the male oblique but broader. Hind wing also more darkly shaded, the postdiscal, transverse, curved, black band entirely absent. *Underside* as in the male but darker, the fore-wing especially more thickly shaded with black scaling, the preapical inter-spaces tinged with yellow. Antennæ, thorax and abdomen similar to those in *eucharis*. Expanse : 78-84mm.

Habits.—As far as is known the species has not been bred. Specimens from the Himalayas are said to be paler than those from Burma and have the yellow on hind wing on the underside often restricted to the base and to the posterior half of wing. There are two very nearly allied races or species called *D. metarete* and *ethira* from Southern Tenasserim and Madras ; Orissa ; Lower Bengal, respectively. *D. hierta* exists in the Himalayas from Kumaon to Sikhim in the low, hot valleys ; Bengal ; Calcutta (*de Nicéville*) ; Assam ; Burma to Northern Tenasserim ; extending to Siam. The larva of another species from Nepal, Sikhim, Assam, Burma, Tenasserim, extending to the Malay Peninsula and Borneo and, on the east, to South China, namely, *D. aglaia*, is, from the description, probably very similar to that of our *D. eucharis* ; but is said to feed upon *Nauclea rotundifolia* a species belonging to the family *Rubiaceæ*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

89. Delias eucharis. *Upperside*: white. Fore wing: the veins broadly black, this colour broadened triangularly at the termination of the veins, costal margin narrowly black; a broad, black, postdiscal, transverse band from costa to dorsum, sloped obliquely outwards from costa to vein 4, thence parallel to termen. Hind wing with the veins similar but for three-fourths of their length much more narrowly black; a postdiscal, transverse, black band as on the fore wing but much narrower, curved and extended only between veins 2 and 6; beyond this the veins are more broadly black and this colour, as on the fore wing, broadens out triangularly at the temination of the veins; the interspaces beyond the postdiscal, black band pink, due to the vermilion coloration of the underside showing through. *Underside*: fore wing similar but the black edging to the veins much broader, the upper two interspaces beyond the postdiscal, transverse band tinged with yellow. Hind wing: ground-colour bright yellow, the veins and transverse, postdiscal band as on the upperside but much more broadly black, the latter extended from the costa to vein 2; the interspaces between the veins beyond the postdiscal fascia with a series of broadly lanceolate or cone-shaped, vermilion-red spots, each spot very narrowly edged with white; the basal portion of interspace 6 white, in contrast to the bright yellow of the ground-colour. Antennæ black; head, thorax and abdomen white, the apical joint of the palpi black; the head and thorax with a mixture of black hairs that gives these parts a grey-blue appearance. *Upper* and *undersides* similar to those in the female, but the black edging to the veins and the postdiscal, transverse bands on both fore and hind wings very much broader. Expanse: 80-85mm.

Egg.—Light yellow in colour; white immediately after laying; very shiny, of an ordinary size, ovoid in shape, truncated at bottom, standing erect, smooth with indications of course longitudinal striation.

Larva.—(Pl. 1, figure 17.) Head round, flattish, black, with a white line at base of jaws and mandibles; antennæ white, black tipped. Body cylindrical; 2nd segment slightly smaller than head; anal segment ends round and is short. The colour of the body is a greasy, greenish-yellow brown. The front half of the 2nd segment is white, with a black patch dorsally behind the white part; there is a lateral white line on segments 2 and 3. The head is sparsely covered with long, white hairs, those near the top of face being longer than the others. The 2nd segment has a collar of 6 longish white hairs. There is a subdorsal row of long, white, erect hairs, one to each segment proceeding each from a white tubercle; there is also a dorsolateral and supraspiracular row of white hairs, each hair proceeding from a white tubercle. The body is besides covered with small white tubercles, each surmounted by a small erect, white hair. Spiracles smallish, oval, light. Ventrum yellow. L: 40mm.; B: 6mm.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Pupa.—(Pl. 1, figure 17.) Head round in front surmounted on its vertex by two subdorsal cylindrical, round-topped, short tubercles, one on each side; and with a single central, short spherical, very short-pedicelled tubercle, pointing straight forward. 2nd segment highly carinated in dorsal line and slightly convex. Thorax also carniated in dorsal line, but separated from 2nd segment by a depression, sloping up considerably to apex and down again to 4th segment, short, with a broad base-short tubercle on the shoulder, convex. Wing-line very slightly laterally expanded at the commencement, flush afterwards. Abdomen circular in transverse section, swollen at the 7th segment which is the stoutest part of the body, decreasing gradually afterwards to the stout triangular cremaster which is curved down at the end. There is a dorsal row of pointed, conical, rather large tubercles, a subdorsal row of much smaller ones on segments 2 to 12 (the dorsal ones only on segments 6 to 11) and a supraspiracular row on segments 3 to 9. The surface is glabrous, shiny, and of a slightly greenish, light yellow. The front tubercle of head, all the dorsal tubercles, the lateral tubercles of segments 6 to 9, are shiny black. There is a shiny black mark dorsally on the very front of the thorax, on the eye-ball, and behind the shoulder-tubercle; also, generally, a black, curved line round the front of the shoulder-tubercle, round the front of the eye-ball, and triangular marks along the terminal margin of wings, six to each; the antennæ are sometimes transversely striated with black and the inner margin of wings, underside of head and space between the antennæ are often thickly lined with black; the abdomen is patched laterally with black on the 10th to 12th segments; the sides, underside, the base of cremaster are marked more or less with the same shiny black. L: 25mm.; B: 7mm.

Habits.—The eggs are laid in batches of 10 to 20 on the underside of a leaf, without order of any sort though close together. The larvæ on emerging proceed to eat the egg-shell and generally demolish each its own totally before moving off. The whole brood then goes off one after the other, closely following each other, to the margin of the leaf which is nearly always an old one and never a very young one. They commence feeding side by side, finishing one leaf after another; and they live like this right through all the stages. They are always badly parasitised and generally by *Dirtera* or flies. They are sluggish in their movements and drop by a silk when disturbed, though not very readily. When about to pupate, each larva goes off by itself and ties itself up by a tail-pad and body-string to a horizontal or perpendicular surface, the attachment being strong and the body-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

string close. The butterfly takes about a week to emerge and all of one brood do not necessarily emerge the same day because the larvæ take uneven periods to grow, some getting ahead of others; so the pupation of a brood does not all take place on the same day; some individuals may be several days behind the main body. The perfect insects are weak fliers and flutter about, hardly ever flying straight; they frequent trees and are generally found flying round them, mango trees being particular favourites as they are such good hosts for the parasitic mistletoes, *Loranthus* of various species. They fly fairly high as a rule and keep to places where there is tree-growth because of the food-plant which is only found on woody vegetation. They rest with the wings closed over the back, are found on the wing in all weather and occasionally may be seen drinking at moist patches on roads and in river-beds in the hot weather; they also frequent flowers; and generally sit down to enjoy their repast, never hovering or agitating their wings (few whites do this) while thus engaged; they come to a complete rest. The food-plant is *Loranthus* of various species as already stated and it has been bred upon *L. longiflorus*, Desrouss; *elasticus*, Desrouss, and *scurrula*, L., but nearly certainly feeds upon them all. The distribution is the Himalayas up to 7,000 feet; the whole of continental India except the desert tracts; Ceylon. There are 7 species of *Delias* enumerated by Colonel Bingham for British India, with four Races; 11 forms, that is, of which 4 have been alluded to above, and have red terminal markings on the underside. *D. descombesi*, Boisd., from Sikhim, Butan, Assam, Burma, Tenasserim, Siam, Malay Peninsula has red basal markings as well as *D. aglaia*, L., with a nearly similar distribution but extending to Borneo and China; and *D. thysbe*, Cramer, from the same places as *descombesi*. *Delias agostina*, Hewtson, and *D. belladonna*, Fabr., have no red markings on the underside; they are both Himalayan, extending to Assam; the latter from Kulu eastwards extending to China, the former limited westwards by Nepal and not found in China. *Khanda*, Doherty, is a form or race of *thysbe*; *agoranis*, Grose-Smith, of *agostina*.

90. Prioneris sita. ♂. *Upperside*: white, with a slight glaucous tint. Fore and hind wings: the postdiscal markings of the *underside* seen

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

through faintly by transparency; all the veins of the fore wing from base and the veins of the hind wing on the outer third margined narrowly with black, that towards the terminal margin broadens, coalesces, and forms a band on the extreme margin; on the fore wing this is comparatively broad and the black markings more or less triangular; at each vein on the hind wing the band is reduced to mere black lines, slightly broader anteriorly than posteriorly. *Underside*: fore wing white, costa black, apex suffused with yellow, all the veins from the base broadly bordered with black that does not extend towards their apices; an ill-defined transverse, somewhat diffuse; postdiscal black band from veins 1 to 7. Hind wing: rich chrome-yellow up to a postdiscal black band, beyond which the ground-colour is white with a series of large, terminal, vermillion-red, rectangular or truncated, cone-shaped spots; veins from base bordered somewhat narrowly but conspicuously with black. Antennæ brownish black, head and thorax clothed with long bluish-grey hairs, abdomen glaucous white: beneath: the palpi and thorax greyish white, abdomen white. Female very similar, the black edgings to the veins on fore and hind wings on both upper and undersides broader; on the upperside the veins of the hind wing as well as of the fore being black right up to the base. *Upperside*: fore and hind wings with a well marked, dusky-black, postdiscal, diffuse band; cell of the fore wing traversed by three slender, longitudinal, black lines. *Underside*: the yellow and vermillion tints brighter than in the male. Expanse: 86-90mm.

Larva.—Colour dull blue-green. Head and all the segments dotted with minute blue tubercles, those on the head and sides black-tipped; dorsal surface pubescent; a lateral fringe of soft white hairs below the spiracles.

Pupa.—"Bright green. Sharply pointed at the head, with two strong lateral points and keeled on dorsal surface of thoracic segments; an interrupted, yellow, dorsal line, and a short, curved, crimson line on each side below thoracic segments bordering a small, white, irregular, black-speckled spot." (*E. E. Green, MS. note as quoted by Moore.*)

This description has been taken from Bingham's *Butterflies* in the *Fauna of British India.* In another pupa obtained in the Kanara District of the Bombay Presidency there was no sign of the crimson-bordered, black-speckled spot. It was very like the pupæ of the *Appias* (v. Pl. 1, fig. 18*a*) genus only larger and stouter. The butterfly is certainly not ever found in the plain country but will be met with at Mahableshwar hill-station in the Bombay Presidency and, may be, further north as far as Thana in the hilly jungles. It is extremely like *Delias eucharis* at first sight but has much more pointed wings and is a far faster and stronger flier; the red on the underside of hindwing is of a pinker tint and the whole insect is more aristocratic looking. It inhabits the big evergreen jungles of the Western

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Explanation of Plate J.

Fig. 64. Catopsilia pyranthe, ♂; 64 a, ♀.

,, 65. Ixias pyrene, ♂; 65 a, b, ♀ ♀.

,, 66. Hebomoia australis, ♂; 66 a, ♀.

,, 67. Colotis etrida, ♂; 67 a, ♀.

,, 68. ,, amata, ♂.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Ghats in Bombay and generally keeps to the very tops of trees, and the trees are very large and tall. On the hill tops, however, where there are huge boulders and rocks, often with the food-plant growing over them, *P. sita* may be found, in certain localities, within the radius of a long-handled net ; but it is never an easy insect to catch. It is very quick at dodging and never flies slowly although it constantly, in such places, returns again and again over the same route. It appears about 8 o'clock in the morning and likes the sunshine ; after 2 p.m. it disappears. It comes to damp places on roads and in nalla-beds in the hot days preceding the monsoon with *P. antiphates*, *P. doson* and others, and may then be most easily caught by dropping a net over the whole crowd ; but the spots and times where the exact conditions that attract it exist, are not often met with and so it comes about that it is one of the most difficult insects to get. It will come to a decoy under the last conditions so that one may capture a certain number if fortunate in time and place. All thus captured are, however, males ; the females neither fly round the hill-tops nor come to drink on the ground. They may occasionally be seen round the food-plants but even that is rare. The larva feeds upon Capers ; it certainly will be found on *Capparis horrida L.* for the Kanara chrysalis above alluded to was found on a leaf of that climber. The distribution is Southern India and Ceylon. There are two other Indian species, *P. thestylis*, Dblday, with a wide distribution from Mussoorie to Sikhim in the Himalayas ; Assam ; Burma ; Tenasserim and Siam ; and *P. clemantha* from Sikhim, Butan, Assam, Burma, Tenasserim and Siam. All three are remarkably like species of *Delias*.

91. Anaphaeis mesentina. *Wet-season form.* Male *upperside*: white. Forewing : costa to base of vein 11 dusky black, thence continued in a jet-black, gradually widened, curved, short streak along the discocellulars to the lower apex of cell : apical area diagonally with the termen black, the former with six elongate, outwardly pointed spots of the ground colour enclosed one in each of the interspaces 3, 4, 5, 6, 8 and 9. Hindwing : uniform, the black along the venation on the underside seen through by transparency ; termen between veins 2 and 6 somewhat broadly black, with a series of four round spots of the ground-colour in the interspaces ; below vein 2 and above vein 6 the termen is very narrowly black. *Underside* : forewing white, marking similar, more clearly defined, the white spots within the black apical area larger. Hind wing : yellowish-white, all the veins very broadly bordered with black ; interspaces 1, 2, 6 and 7 with cross bars of black, beyond which there is a subterminal, somewhat broad, transverse band of black, between veins 2 and 6. Cilia of both fore and hindwings white alternated with black. The ground-colour on both upper and undersides variable, often cream-coloured above ; beneath : in some specimens, the base of cell and the elongate spots in apical area of fore-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

wing and the whole surface of the hind wing varies to rich chrome-yellow. Female similar; the black markings on both upper and undersides broader, the white spots on black apical area of forewing often sub-obsolete above. Antennæ in both sexes black, sparsely sprinkled with white dots; head, thorax and abdomen above and below white; thorax above often bluish grey. *Dry-season form.* Male and female: similar to male and female of wet-season form, but on the upperside the black markings are narrower, the white markings on the black apical area of forewing broader and longer, and on the hindwing the narrow inner margining to the black on the termen very narrow, somewhat obsolescent; therefore, the white subterminal spots have the appearance of opening inwards. *Underside*: ground colour almost pure white; on the hindwing slightly tinged with yellow. Antennæ, head, thorax and abdomen as in the wet-season form. Expanse: 42-62mm.

Egg.—Is of the usual type of pierid egg, cylindrical with a domed top, twice as high as broad, the dome truncated in a small circle at apex where the 12 meridional ridges, triangular in tranverse section, meet in a thickened ring, their extremities hardly forming teeth round it or on it; the surface is shiny and finely, transversely striated both on the ridges and intervening parts. Colour white when laid, turning orange. L.: ·5mm; B: about ·25 mm.

Larva.—The first stage of the little larva has the head black and shiny, set with long, white hairs; the colour of the body is oily yellowish-green and there is a dorsolateral hair to each segment carrying a globule of liquid at its tip; the anal end is reddish.

The second stage is very much the same as the first in colour of head and body and everything except size which is of course somewhat larger.

The third stage, has the head black, shiny with a bright yellow, triangular clypeus and it is set all over with white bristles proceeding from minute tubercles. The body is cylindrical and has the usual subdorsal, dorsolateral, supraspiracular tubercles as well as one subspiracular, each bearing an erect bristle at its tip. Body green with a broad, supraspiracular, purple-brown band.

Fourth stage.—Head shiny black with rather long, erect hairs which are either white or the colour of the head; a yellow line bordering the clypeus distinct. Anal segment rounded in outline, though inclined to be square-ended, about as long as broad, only slightly convex dorsally, with two yellow, vitreous tubercles, one on each side of dorsal line. Body surface oily-looking with the usual tubercles, subdorsal, dorsolateral and supraspiracular, yellow, vitreous and conical, each bearing a short, brown hair which may exude a globule of liquid from its tip; there is a subspiracular tubercle, bearing a longish white hair, as large as these; besides these main tubercles there are many minute ones, each bearing a short, fine,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

white hair; there is a subspiracular fringe of rather long, fine, white hairs which is, however, not very thick. Spiracles broadly round, not large, light with a raised, shiny, thin, brown border. Colour of body greenish ochreous, with a broad supraspiracular band mottled with white, the region below it white enamelled with blotches of green, brown and yellow; there is a dorsal, double green line.

When the larva is full-grown it has the head very dark purplish with a moderately large, rather narrowly triangular, greenish clypeus bordered inside narrowly purple, outside broadly green; surface of head shiny, rough with many tubercles, mostly white, all rather small except a subdorsal one just below vertex and a dorsolateral one about the same height as the apex of clypeus and one near base which are larger and vitreous-yellow; all bear white hairs, the larger ones longer hairs than the rest; labrum, ligula, eyes and second antennal joint whitish; basal antennal joint green. Surface of body as in the last stage, the main tubercles perhaps slightly less conspicuous, each bearing a short, brown, cylindrical hair hardly longer than the numerous lesser white ones which are practically the same as in the last stage also. Spiracles not large, flush, oval, light with a thin, shiny, brownish, slightly raised border, those of segments 2 and 12 larger than the rest. Colour much as in last stage, the purple band only dotted with the little white tubercles; the region below it greenish mottled brown; the base of prolegs purplish, the feet lobed, light greenish like ventrum; the true legs the same with purple patch on basal part; the broad, green-ochreous, dorsal colour finishes square at the hinder margin of segment 12 or nearly so. L : 35 mm.; B : 4mm.

Pupa.—The pupa is somewhat of the type of the *Appias-lupina* lot although the points are not quite so prominent and the dorsal parts of the segments that bear them are not so flattened. The body is thickest at middle; the 7th segment is swollen at the anterior margin very slightly and runs out over spiracle laterally into a triangular, very prominent, sharp tooth which is flattened above and below and curved up a good deal, it bears the spiracle on its lower surface in its posterior basal angle; the thorax is carinated highly in its dorsal line and the apex of the carination, a little behind the middle of thoracic length, is the highest part of pupa, whence the dorsal line slopes anteriorly to segment 2 and posteriorly to segment 5. The vertex of head is in a plane only slightly inclined towards longitudinal axis of pupa, is short and with the eyes on each side is as broad as segment 2; frons is produced out into a curved-up snout, from a conical base as broad as half the breadth of front of pupa, soon thinning to ⅓rd of that, then more or less parallel-sided, suddenly constricted shortly before the blunt tip; this snout is as long as segment 2. Segment 2 is carinated in dorsal line though much less than the thorax, is rather convex transversely and has the front margin with a dorsal sinus, the hinder

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

margin straight and slopes up towards thorax at a small angle. The thorax is very convex, not long, highly carinated as already mentioned in dorsal line, the hinder margin a gentle curve meeting the wing-line in a largely-rounded, open angle of rather less than 90°. There is a slight constriction between thorax and abdomen dorsally, none laterally. The pupa at shoulders is broader than at the hinder margin of segment 2, and slightly tuberculate, after which the breadth of the body gradually decreases up to base of the lateral tooth on segment 7; after this it again decreases gradually to cremaster; the keel of the thorax runs into the dorsal line of segment 4; the ventral line of pupa is only slightly curved along suture-line of wings towards apices of these, the ventral line of snout of head is in a higher though parallel plane to the rest. The cremaster is square, forming, as usual, the end of segment 13 which is trapeze-shaped; the former has strong extensor ridges dorsally, ending behind in little knobs, the suspensory booklets being at the extremity between the knobs; the ventral ridges are curved towards each other. The surface of pupa is finely transversely impressed-lined, mostly very irregularly so though fairly closely; on the thorax and front segments the lines are in all directions; the membranes (intersegmental) between segments 8, 9 and 10 are broadly exposed; the subdorsal and supraspiracular tubercles of larva exist here as conspicuous, small, nearly hemispherical bosses on all segments but bear no hairs; the dorsolateral ones are less prominently indicated at hinder margin of segments; the antennæ reach end of wings. The spiracles of segment 2 are indicated by a rounded slight thickening in a curve of front margin of segment 3, rather long and smooth; others are white, broadly oval, of medium size, with a fine, brown border, slightly raised; there are short, fine hairs round eyes and on head vertex only. The colour of pupa is green with a faint supraspiracular band representing those of the larva; top of thoracic carina is black behind, yellowish in front; end of snout is yellow, the sides are black as also shoulder points and teeth of segment 7; tubercles all black; abdomen tinged yellow; wings marked with black; the surface of abdomen is also pitted. Sometimes the pupa is greyish bone-coloured and then the tubercles are bright orange-yellow. L: 23mm.; B: 26mm.

Habits.—The eggs are laid in clusters up to 200 in a batch on the young shoots or the undersides of young leaves; the larvæ eat their way out near the top as a rule and as often as not do not eat the egg-shell; they herd together during the first stages but separate in the last, feeding all the time on the young succulent parts of the plant; they eat voraciously and grow rapidly like all the others of the family. The pupation often takes place in company, one close up against the other on a perpendicular

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

surface or horizontal, on the upperside or underside of a leaf or against a stone or tree-trunk indiscriminately. The fixture is strong at the tail and the body-band is short. The females of a brood emerge before the males. The butterfly is a fairly strong flier and keeps to open places and the hot sunshine; it flies low and is fond of resting on the ground with its wings closed over its back and, in dull weather, the upper wings drawn down between the lower ones. As may be imagined from the number of eggs laid in a single batch, the perfect insects are very numerous wherever they exist, notwithstanding the fact that the larvæ are so subject to parasitic attack. It is an insect of the plains and dry regions more particularly, although it exists up to 6,000 feet elevation in the Himalayas and 8,000 feet in the Nilgiris; it is not uncommon near the sea-coast in Kanara where the rainfall is over 100 inches. Its food-plants are all Capers and it has been bred on *Capparis aphylla*, *C. sepiaria*, *C. heyeana*, *Cadaba indica* and *Mærua arenaria*, the latter two species also belonging to the *Capparideæ*. Its distribution is the Himalayas from Kashmir to Sikhim up to 6,000 feet, and through the plains to Southern India; one specimen is recorded as having been caught in Great Nicobar Island, though it has not been recorded from Burma or Assam; in the west through Persia to Arabia and Africa. There is one form of the insect which by some is considered another species, *A. taprobana*, Moore, that occurs in Ceylon, in which the male resembles the female of the typical form and the female has the whole apical area of the forewing black; in both sexes the underside of hindwing has the ground-colour, a rich chrome-yellow.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON A BIRD COLLECTING TRIP IN THE BALAGHAT DISTRICT OF THE CENTRAL PROVINCES.

BY

E. A. D'ABREU, F.Z.S.

Early in January 1912, I had the good fortune to be deputed to collect birds in the Balaghat District for the Nagpur Museum. The express purpose of the expedition was to secure such specimens as were not represented in the Museum and accordingly no wholesale slaughter of birds was indulged in, only such specimens were shot as were needed.

A list of the birds seen and identified with certainty is given, but this cannot be considered complete, for only a part of the district was traversed and that very hurriedly.

The District of Balaghat lies to the north-east of Nagpur. It is bounded on the north by the Mandla District, on the south by the Bhandara District, west by Seoni and east by the districts of Bilaspur and Drug. It is mostly hilly except for the valleys of the Wainganga and the Banjar. To the north-east is the Topla Plateau. Heavy forests are plentiful and large quantities of timber exported. Other industries appear to be mainly agricultural, and cattle-rearing is carried on in some parts. Manganese ore is plentiful and there are several companies excavating it.

The party consisted of five : myself, a fieldman, two peons, one of whom was kindly lent to us by the Forest Department, and a cook. Before beginning this account I would like to mention that this is the first time I have collected in the Central Provinces and I had absolutely no knowledge of the country. Country carts were available in most places and these formed our mode of conveyance from one stage to another.

The party left Nagpur on the morning of the 3rd and reached Balaghat in the afternoon ; here we found carts and the Forest Officer's shooting chakra waiting for us. A chakra is a bullock cart built on a very light scale, suitable to seat one or two persons at the most. This chakra differed a great deal from the common ones used by the natives ; there was a hood to it and the seat was in the form of a chair and on either side of it was a rack to rest one's guns in. A common practice in the Central Provinces is to shoot from off a bullock cart, antelope and such like are so used to seeing these vehicles pass near them that they have lost all fear of them and the sportsman is able to get well within range which most probably he could not do on foot. Carts can also be used in forests if the ground is not very uneven and the forest not too dense ; moreover most forests have cart roads running through them.

On our arrival at Balaghat station we proceeded to the Dak Bungalow

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

for the night and that very evening collected our first specimen, a Black-headed Oriole (*Oriolus melanocephalus*). This bird and the Indian Oriole (*O. kundoo*) are the common orioles of the Central Provinces. At Nagpur *O. kundoo* is common while *O. melanocephalus* is rare, but in this district the reverse seems to be the case. *O. melanocephalus* is common everywhere while *O. kundoo* was only met with at Baihar.

The next day a move was made to the Tikari Inspection Hut, a distance of seven miles from Balaghat. Here we were near the hills and close to heavy forest. The Bungalow is between the villages of Pipartola and Tikari; a nulla runs along the side of the Bungalow and close to the Tikari village is a large jheel which we visited the next morning. As we approached it a large flock of Painted Storks were visible on a tree on the other side of the jheel, Egrets of two or three species studded the edges, their white plumage showing distinctly among the green surroundings, a Darter or two were seated on adjoining trees and the usual set of waders (Herons, Sandpipers, etc.) were to be seen here and there in all directions but no ducks were visible.

We decided to begin with the Painted Storks, but they flew off in a body on my approach to a tree on the other side of the jheel. I attempted to follow but in a bend of the jheel came across an Adjutant Stork feeding all by himself. He was more of a prize to me, being the first one I had set eyes on in the Central Provinces, but before I could put in a cartridge suitable to his size, he was off and perched himself on a distant tree. He was followed up but would not allow me to get within range. In the meantime his painted brethren had also made themselves scarce but we consoled ourselves with the hope of shooting them later on. We returned to the bungalow working our way along the nullah; here we secured specimens of Tickell's Flowerpecker (*Dicæum erythrorhynchus*) and a Jungle Owlet *Glaucidium radiatum*). The latter seemed quite awake although it was midday. Near the nullah we saw a troop of about fifty monkeys (*Presbytis entellus*), most of them were squatting on the ground and gave one the impression of labourers working in a field. They showed no fear of us and when a gun was levelled at them they did not seem to know the meaning of it. None were shot as we did not want them. We visited the same spot the next day and we found the monkeys still on the same ground. I made it a point to visit the spot every day and to my surprise I found them on the same spot for six days. In the afternoon shots were fired at some White-necked Storks but none were bagged. The next morning we visited the jheel again and the Painted Storks were on the same tree they had occupied the day before. This time I sent my fieldman for them with instructions to fire if he got well within range, while I hid against the tree they made for yesterday. To my delight they went through the same tactics they did before, but instead of settling straight away, they took it

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

into their heads to fly in a circle round the tree, prior to settling. It was all up, a long shot was chanced, a few feathers fell to the ground and the storks betook themselves to pastures new. We did the same. I made a bee line for the forest country while the fieldman consoled himself with a Brahminy Kite and made for the Bungalow, shooting *en route* a pair of Greenshanks and a Black Vulture. In the forest country I secured a pair of Rose Finches, a Crested Goshawk and a large Cuckoo-Shrike. The Rose Finch is a migratory bird with us, the hen is a plain bird resembling a hen-sparrow while the cock is of a beautiful rose tint. It is a common cage bird in parts of India, especially in Behar, where it is termed the Tuti. They never seem to survive through the warm weather. On my return to the bungalow at about 1 p.m. a smell seemed to pervade the whole place and the vulture was pointed out to me as the source of the same. There was no getting away from it, it could be perceived in all the rooms, even the breakfast that day had a taint of it. However the bird had to be dealt with, but it took us some time to make up our minds to skin it, nevertheless we had his skin off by sunset but we took care to sprinkle some spirit over him to deaden the smell. We had him fixed up before noon the next day and his carcase was thrown away and it was not long before the crows spotted it and this attracted the kites and other vultures. As there were no vultures in the museum we decided to finish off with them as we were about it, so a white-backed one (*Pseudogyps bengalensis*) was shot. It dropped into a nullah and while I was hunting for it a crowd of servants came calling for me saying that the 'burra saheb' wanted to see me. This was the Deputy Commissioner who was passing through and hearing the crack of my gun came to see what I had shot. He was much interested in natural history and examined with keenness the specimens I had already collected, moreover, he very kindly offered to help the expedition, an offer which was heartily accepted. Our second vulture did not smell so bad as the first and on close inspection looked quite a handsome bird; his bill was of a fine bluish tint, his neck was grey, his back spotlessly white and his black underparts were striated with white, while round his neck was a collar of white down.

The jheel was visited again the next day but it was deserted, only a Darter and another bird were sitting on the trees patronised by the storks. The Darter soon made himself scarce but we bagged the other bird which turned out to be the Little Cormorant (*Phalacrocorax javanicus*).

Our attention was now exclusively devoted to the forest country. Sambhar, spotted deer and wild pig were very plentiful and we frequently disturbed them as we shot at small birds with our 'fourten.' Once I shot at a minivet and a pig jumped up a few feet from the place I stood. We came across the pugs of bears and panthers but never saw any in the flesh. One evening we disturbed a spotted deer with a very good head and that

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

very evening came across a pig lying down. I pointed it out to the forest guard who was with me at the time but he insisted on its being a log of wood till piggy took to his heels. We secured for ourselves a Chestnut-bellied Nuthatch and a pair of Scarlet Minivets (*Pericrocotus speciosus*); the cock is a scarlet and black bird while the hen is yellow and grey. Strange to say, the cock minivet, the moment he saw me, flew to a tree with red leaves and I have often noticed on the Himalayas *P. brevirostris*, a bird similarly coloured, do the same. Can this be an instance of protective coloration?

Our last day at Tikari was almost a blank; only a Pale Harrier was collected, but a bird resembling the Nilgiri Thrush was seen in the forest country.

Leaving Pipartola, a move was made to Somnapur, passing Laughur *en route*. Laughur is on the hills at an altitude of 1,933 feet; it is a great place for big game shooting. After we had passed Laughur, we saw Peafowl, Jungle Fowl and Spotted Deer on the road. Once we heard the screeches of birds resembling the call of the Malabar Pied Hornbill and attempts were made to secure them, but they were not seen. Along the roadsides lizards of the families *Agamidæ* and *Scincidæ* were plentiful and I recognised *Mabuia carinata* and *M. macularia* amongst them. The Southern Red-whiskered Bulbul, Sunbirds, White-eyes, Paradise and Grey-headed Flycatchers were very common at Laughur.

We reached Somnapur at night and next morning the forests near the bungalow were visited. Some sambhar and monkeys were seen but nothing of special interest in the bird line. In the afternoon we had better luck, a jheel was visited and an Egret, some Whistling Teal and a pair of Little Ringed vers secured. A Redshank and some Jacanas were seen.

On visiting the jheel the next day an Adjutant and a Heron were seen seated on a tree. On my approach the Stork took to his wings but I secured the Heron which proved to be the Common Heron (*Ardea cinerea*). The Jacanas were again seen and to my delight I shot one which rolled over apparently hard hit. The Chaprassi waded for it while I moved on towards the end of the jheel after some other birds and on my return he declared the Jacana could not be found. On my way home a Pale Harrier was shot; it was observed following a pariah dog and sitting down near it whenever the dog sat down. When about two miles from the bungalow, a large Stork suddenly flew up from a ditch and sat on a tree. It was shot and turned out to be the Lesser Adjutant (*Leptoptilus javanicus*). Somnapur is a great place for small birds, the trees round the bungalow simply swarmed with them, Bhimrajas (Racket-tailed Drongos) Mynas, Babblers, Hornbills, Koopoes, Barbets, Woodpeckers, Parakeets, Bee-eaters, Doves, Flycatchers, Wagtails, Bulbuls, Tits, Mini-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

vets, Shrikes, Kingcrows, Sunbirds, Pipits, all were plentiful, while Peafowl and Red Jungle Fowl were seen in greater numbers than elsewhere. In the course of our rambles we came across a large flock of Jungle Fowl in an open glade. We did not get a shot but we noticed that near the place where the fowls were, there was a sort of 'machan.' This we made use of the next day and at precisely the same time the birds came out, but they were out of range though moving towards us. A cock bird came well within range, but we wanted a hen, so we waited, but some cattle passing through the glade drove the birds away. We waited, nevertheless, in the hope that they may appear again, and as it got dusk, the Nightjars began to utter their cries and the air was alive with them. From their sizes they appeared to belong to three different species. One that flew close to us was shot and turned out to be Horsfield's Nightjar (*C. macrurus*). Among other birds collected here were the White-browed Blue Fly-catcher, the Pigmy Woodpecker, the White-eyed Buzzard-Eagle, the Pale Harrier, the Common Snipe, the Western Blossom-headed Parakeet and the Large Indian Parakeet.

A Crested Serpent Eagle (*Spilornis cheela*) was also shot by mistake. If there is an eagle that baulks the collector it is this species. He has many phases of coloration and I have got him in every phase in the Nagpur Museum, so do not wish to have anything more to do with him; yet he will come in my way. If I see an eagle the identity of which is uncertain and shoot it accordingly, it is bound to be a Cheela. On the other hand if I spare a bird thinking it to be a Cheela, it is bound to turn out something else. Parakeets of three species were very plentiful all over the district; these were the Rose-ringed Parakeet, the Western Blossom-headed Parakeet and the Large Indian Parakeet, but the Blossom-headed Parakeet far outnumbered the other two. Of Doves five species were noticed, namely the Spotted Dove, Ring Dove, Little Brown Dove, Rufous Turtle Dove and the Red Turtle Dove. The Spotted Dove far outnumbered the others at Pipartola and Somnapur; while at Baihar, Muki and on the plateau the Ring Dove predominated and at Paraswara the Rufous-Turtle Dove was seen in greater numbers than elsewhere. The Rufous-backed Shrike appears to be the common Shrike of the district for we noticed him everywhere; the Bay-backed Shrike was only seen in numbers between Pipartola and Balaghat.

From Somnapur we moved on to Muki *via* Baihar. The country between Baihar and Muki is not hilly, nor are the forests dense. Two large streams were crossed, the Tonaur near Baihar and the Banjar near Muki. Black Buck, Green Pigeons and a few Harriers were about, the only things seen on the road. From Muki we journeyed on towards the Topla plateau and after ascending the ghaut the country gradually opened out into an undulating plain almost devoid of trees. A Crested Hawk-Eagle was shot

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

near the ghaut and further on large numbers of Coursers were seen and a few secured.

Parsatola was reached at about 2 p. m. Here we were in an open plain covered with spear grass. Cattle rearing seemed to be the chief occupation of the people, for large herds were seen in all directions. Black Buck and Nilghai were plentiful and the latter might have afforded some excellent runs for a mounted spearman, for the country was suitable in every way. Foxes and Hares were also found and I was told that a Cheeta inhabited the place. The first thing seen next morning was a Fox, it was eventually shot and turned out to be the Common Indian Fox (*Vulpes bengalensis*).

On the 22nd nothing in particular was shot, some Black Ibis, Stone-Curlews and a small dark-coloured species of Quail were seen. Attempts were made to shoot some Saruses, but without success, and I had to content myself with a Rufous Fantail-Warbler (*Cisticola cursitans*).

We returned from Parsatola on the 23rd, shooting some Green Pigeons on the way, but they turned out to be the ordinary ones (*Crocopus chlorogaster*). As we neared the hills Nilghai were very plentiful, and a bull which appeared to have a good pair of horns was shot, but they only taped 7·5 and 8 inches. Towards Baihar flocks of peafowl were seen and at dusk a Four-horned Antelope was shot on the roadside. It was not a perfect specimen, the anterior horns were mere knobs and the posterior ones measured 2·8 inches. At Baihar a large Bandicoot Rat (*Nesocia bandicota*) was picked up on the road. It measured about 1 foot 9 inches. From Baihar to Paraswara the country is more or less open except near Sitadongra where it is hilly. Jheels were visited on the way but only Teal of the ordinary kind (*Nettium crecca*) were seen on the first two. The next one seemed more interesting, two White-necked Storks, a Painted Stork and some Herons were in evidence at one end and a flock of White Ibises and an Open-bill at the other. On my approach they all made themselves scarce, but the White-necked Storks were the last to leave and as they rose one was bagged. Further on we came across more White-necked Storks in a ditch on the road side and here they took no notice of us, though we were only a few yards from them. The next jheel contained a flock of Ibises and some Herons. A shot at the Ibises proved a failure but a large flock of Teal rose out of the rushes and among them were two ducks of a larger kind, the second barrel discharged into them only resulted in bringing a Teal to the ground. An Egret, probably of the lesser or larger species, was also shot at and fell to the ground, apparently stunned for when the peon went to pick it up it recovered and flew off.

At Paraswara we found Saruses very plentiful, but they were very shy and always flew off before we got within range.

On the 27th I visited a jheel about 3 miles from the bungalow. Four

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

young Black-necked Storks and a pair of Saruses were seen. Shots were fired at the Saruses in preference and one was evidently hit for he settled after flying a short distance; two more shots were had at him but without effect. The storks meanwhile had settled in some fields about a mile away. Some cover being available one was shot. The others hovered over it and an adult female bird came flying towards it. I was still well concealed and the contents of my second barrel brought her to the ground. On our way home two Black Buck ran quite close to us, but we had no rifle with us at the time.

On the 28th the jheel in front of the bungalow was patronised. Several Coots, Dabchicks and Bronze-winged Jacanas were seen and two of the latter and a Snipe were bagged. Species of Herons and Egrets which we wanted and a Pied Harrier were seen but not secured. We tried for these the next day but had to content ourselves with a Marsh Harrier. A pair of Saruses were again tried for, but with the usual result. Snipe and Quail were very plentiful here and a little shooting was indulged in. Five shots brought to bag seven birds. The Snipes were Fantails and Pintails and the Quails were black-breasted ones. On our way back Saruses were again seen, and this time I waited till it got dark and then tried to get within range, but it was of no avail.

Leaving Paraswara a move was made to Lamtha and the jheel at Bhondua visited. Ducks were seen in the middle of the jheel and Storks and Saruses at the edges. The Ducks being out of range we tried our luck again at Saruses but with the same result. At Lamtha we took train and returned to Nagpur.

LIST OF BIRDS OBSERVED IN THE BALAGHAT DISTRICT, CENTRAL PROVINCES.

Order Passeres.

1.	Corvus macrorhynchus ..	The Jungle-Crow.
2.	Corvus splendens	The Indian House-Crow.
3.	Dendrocitta rufa	The Indian Tree-pie.
4.	Machlolophus haplonotus ..	The Southern Yellow Tit.
5.	Argya caudata	The Common Babbler.
6.	Argya malcolmi	The Large Grey Babbler.
7.	Crateropus canorus ..	The Jungle Babbler.
8.	Pyctorhis sinensis ..	The Yellow-eyed Babbler.
9.	Zosterops palpebrosa ..	The Indian White-eye.
10.	Ægithina tiphia	The Common Iora.
11.	Chloropsis jerdoni ..	The Jerdon's Chloropsis.
12.	Molpastes hæmorrhous ..	The Madras Red-vented Bulbul.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

13.	Otocompsa fuscicaudata ..	The Southern Red-whiskered Bulbul.
14.	Sitta castaneiventris ..	The Chestnut-bellied Nuthatch.
15.	Dicrurus ater	The Black Drongo.
16.	Dicrurus cærulescens ..	The White-bellied Drongo.
17.	Dissemurus paradiseus ..	The Larger Racket-tailed Drongo.
18.	Orthotomus sutorius ..	The Indian Tailor-bird.
19.	Cisticola cursitans ..	The Rufous Fantail-Warbler.
20.	Hypolais rama	Sykes's Tree Warbler.
21.	Prinia sylvatica	The Jungle Wren-Warbler.
22.	Prinia inornata	The Indian Wren-Warbler.
23.	Lanius vittatus	The Bay-backed Shrike.
24.	Lanius erythronotus ..	The Rufous-backed Shrike.
25.	Lanius cristatus	The Brown Shrike.
26.	Tephrodornis pondicerianus.	The Common Wood-Shrike.
27.	Pericrocotus speciosus ..	The Indian Scarlet Minivet.
28.	Pericrocotus peregrinus ..	The Small Minivet.
29.	Pericrocotus erythropygius..	The White-bellied Minivet.
30.	Campophaga sykesi ..	The Black-headed Cuckoo-Shrike.
31.	Graucalus macii	The Large Cuckoo-Shrike.
32.	Oriolus kundoo	The Indian Oriole.
33.	Oriolus melanocephalus ..	The Indian Black-headed Oriole.
34.	Pastor roseus	The Rose-coloured Starling.
35.	Sturnus menzbieri ..	The Common Indian Starling.
36.	Temenuchus pagodarum ..	The Black-headed Myna.
37.	Acridotheres tristis ..	The Common Myna.
38.	Sturnopastor contra ..	The Pied Myna.
39.	Siphia parva	The European Red-breasted Flycatcher.
40.	Cyornis superciliaris ..	The White-browed Blue Flycatcher.
41.	Cyornis tickelli	Tickell's Blue Flycatcher.
42.	Alseonax latirostris ..	The Brown Flycatcher.
43.	Culicicapa ceylonensis ..	The Grey-headed Flycatcher.
44.	Terpsiphone paradisi ..	The Indian Paradise Flycatcher.
45.	Rhipidura albifrontata ..	The White-Browed Fantail Flycatcher.
46.	Pratincola caprata ..	The Common Pied Bush-Chat.
47.	Pratincola maura	The Indian Bush-Chat.
48.	Ruticilla rufiventris ..	The Indian Redstart.
49.	Cyanecula suecica ..	The Indian Blue-throat.
50.	Thamnobia cambaiensis ..	The Brown-backed Indian Robin.
51.	Copsychus saularis ..	The Magpie-Robin.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

51A.	Geocichla cyanonotus ..	The White-throated Ground-Thrush.
52.	Uroloncha malabarica ..	The White-throated Munia.
53.	Stictospiza formosa ..	The Green Munia.
54.	Sporæginthus amandava ..	The Indian Red Munia.
55.	Carpodacus erythrinus ..	The Common Rose-Finch.
56.	Gymnorhis flavicollis ..	The Yellow-throated Sparrow.
57.	Passer domesticus ..	The House-Sparrow.
58.	Hirundo smithii	The Wire-tailed Swallow.
59.	Motacilla alba	The White Wagtail.
60.	Motacilla maderaspatensis ..	The Large Pied Wagtail.
61.	Motacilla melanope ..	The Grey Wagtail.
62.	Anthus maculatus ..	The Indian Tree-Pipit.
63.	Anthus striolatus	Blyth's Pipit.
64.	Anthus rufulus	The Indian Pipit.
65.	Mirafra erythroptera ..	The Red-winged Bush-Lark.
66.	Ammomanes phœnicura ..	The Rufous-tailed Finch-Lark.
67.	Pyrrhulauda grisea ..	The Ashy-crowned Finch-Lark.
68.	Arachnechthra asiatica ..	The Purple Sunbird.
69.	Dicœum erythrorhynchus ..	Tickell's Flower-pecker.
70.	Pitta brachyura	The Indian Pitta.

ORDER PICI.

71.	Liopicus mahrattensis ..	The Yellow-fronted Pied Woodpecker.
72.	Iyngipicus hardwickii ..	The Indian Pigmy Woodpecker.
73.	Brachypternus aurantius ..	The Golden-backed Woodpecker.

ORDER ZYGODACTYLI.

74.	Thereiceryx zeylonicus ..	The Common Indian Green Barbet
75.	Xantholæma hæmatocephala.	The Crimson-breasted Barbet.

ORDER ANISODACTYLI.

76.	Coracias indica	The Indian Roller.
77.	Merops viridis	The Common Indian Bee-eater.
78.	Ceryle varia	The Indian Pied Kingfisher.
79.	Alcedo ispida	The Common Kingfisher.
80.	Halcyon smyrnensis ..	The White-breasted Kingfisher.
81.	Lophoceros birostris ..	The Common Grey Hornbill.
82.	Upupa indica	The Indian Hoopoe.

ORDER MACROCHIRES.

83.	Cypselus affinis	The Common Indian Swift.
84.	Caprimulgus macrurus ..	Horsfield's Nightjar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ORDER COCCYGES.

85.	Hierococcyx varius ..	The Common Hawk-Cuckoo.
86.	Eudynamis honorata ..	The Indian Koel.
87.	Centropus sinensis ..	The Common Coucal or Crow-Pheasant.

ORDER PSITTACI.

88.	Palæornis nepalensis ..	The Large Indian Paroquet.
89.	Palæornis torquatus ..	The Rose-ringed Paroquet.
90.	Palæornis cyanocephalus ..	The Western Blossom-headed Paroquet.

ORDER STRIGES.

91.	Scops bakkamœna ..	The Collared Scops Owl.
92.	Athene brama	The Spotted Owlet.
93.	Glaucidium radiatum ..	The Jungle Owlet.
94.	Ninox scutulata	The Brown Hawk-Owl.

ORDER ACCIPITRES.

95.	Otogyps calvus	The Black Vulture.
96.	Pseudogyps bengalensis ..	The Indian White-backed Vulture.
97.	Neophron ginginianus ..	The Smaller White Scavenger Vulture.
98.	Aquila vindhiana	The Indian Tawny Eagle.
99.	Spizætus cirrhatus ..	The Crested Hawk-Eagle.
100.	Spilornis cheela	The Crested Serpent-Eagle.
101.	Butastur teesa	The White-eyed Buzzard-Eagle.
102.	Haliastur indus	The Brahminy Kite.
103.	Milvus govinda	The Common Pariah Kite.
104.	Elanus cæruleus	The Black-winged Kite.
105.	Circus macrurus	The Pale Harrier.
106.	Circus melanoleucus ..	The Pied Harrier.
107.	Circus æruginosus... ..	The Marsh Harrier.
108.	Astur badius	The Shikra.
109.	Lophospizias trivirgatus ..	The Crested Goshawk.
110.	Pernis cristatus	The Crested Honey-Buzzard.
111.	Tinnunculus alaudarius ..	The Kestrel.

ORDER COLUMBÆ.

112.	Crocopus chlorogaster ..	The Southern Green Pigeon.
113.	Turtur suratensis	The Spotted Dove.
114.	Turtur cambayensis ..	The Little Brown Dove.
115.	Turtur risorius	The Indian Ring Dove.
116.	Turtur orientalis	The Rufous Turtle-Dove.
117.	Œnopopelia tranquebarica ..	The Red-Turtle-Dove.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ORDER GALLINÆ.

118.	Pavo cristatus	The Common Peafowl.
119.	Gallus ferrugineus ..	The Red Jungle-fowl.
120.	Coturnix coromandelica ..	The Black-breasted Quail.
121.	Francolinus pondicerianus ..	The Grey Partridge.

ORDER GRALLÆ.

122.	Fulica atra	The Coot.
123.	Grus antigone	The Sarus.
124.	Anthropoides virgo ..	The Demoiselle Crane.

ORDER LIMICOLÆ.

125.	Œdicnemus scolopax ..	The Stone-Curlew.
126.	Cursorius coromandelicus ..	The Indian Courser.
127.	Metopidius indicus ..	The Bronze-winged Jacana.
128.	Hydrophasianus chirurgus ..	The Pheasant-tailed Jacana.
129.	Sarcogrammus indicus ..	The Red-wattled Lapwing.
130.	Ægialitis dubia	The Little Ringed Plover.
131.	Himantopus candidus ..	The Black-winged Stilt.
132.	Totanus hypoleucus ..	The Common Sandpiper.
133.	Totanus glareola	The Wood Sandpiper.
134.	Totanus ochropus.. ..	The Green Sandpiper.
135.	Totanus fuscus	The Spotted Redshank.
136.	Totanus glottis	The Greenshank.
137.	Gallinago cœlestis ..	The Common Snipe.
137*a*.	Gallinago stenura ..	The Pintail Snipe.

ORDER STEGANOPODES.

138.	Phalacrocorax fuscicollis ..	The Indian Shag.
139.	Phalacrocorax javanicus ..	The Little Cormorant.
140.	Plotus melanogaster ..	The Indian Darter.

ORDER HERODIONES.

141.	Ibis melanocephala ..	The White Ibis.
142.	Inocotis papillosus ..	The Black Ibis.
143.	Dissura episcopus ..	The White-necked Stork.
144.	Xenorhynchus asiaticus ..	The Black-necked Stork.
145.	Leptoptilus dubius ..	The Adjutant.
146.	Leptoptilus javanicus ..	The Smaller Adjutant.
147.	Pseudotantalus leucocephalus	The Painted Stork.
148.	Anastomus oscitans ..	The Open-bill.
149.	Ardea manillensis ..	The Eastern Purple Heron.
150.	Ardea cinerea ..	The Common Heron.
151.	Herodias intermedia ..	The Smaller Egret.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

152.	Herodias garetta ..	The Little Egret.
	Herodias alba	The Large Egret is probably found in the District as well.
153.	Bubulcus coromandus ..	The Cattle Egret.
154.	Ardeola grayi	The Pond Heron.

ORDER PHÆNICOPTERI.

No flamingoes were seen by me but I was told that they were occasionally to be met with at Somnapur.

ORDER ANSERES.

155	Dendrocyena javanica ..	The Whistling Teal.
156.	Nettopus coromandelianus..	The Cotton Teal.
157.	Chaulelasmus streperus ..	The Gadwall.
158.	Nettium crecca	The Common Teal.
159.	Dafila acuta	The Pintail.

ORDER PYGOPODES.

162.	Podicipes albipennis ..	The Dabchick.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA.

REPORT BY R. C. WROUGHTON, F.Z.S.

COLLECTION ...	...	No. 5.
LOCALITY ...	...	Dharwar.
DATE ...	...	November-December 1911, February-March 1912.
COLLECTED BY...	...	Mr. G. C. Shortridge.
EARLIER REPORTS	...	No. 1, E. Khandesh, Vol. XXI, p. 392.
		No. 2, Berars, Vol. XXI, p. 820.
		No. 3, Cutch, Vol. XXI, p. 826.
		No. 4, Nimar, Vol. XXI, p. 844.

Dharwar, the district in which the present collection was made, is situated about 15° 30′ N. Lat. and 76° E. Long. At the commencement of the last century Sir W. Elliot, I.C.S., collected the mammals of this district and published a paper on them in the Madras Journal of Literature and Science, 1839. As a description of the district I cannot do better than reproduce here the Introduction to his paper.

"The district of India, in which the animals contained in the following list were procured, is a part of the high tableland towards the south of the Dekhan, commonly called the Southern Mahratta Country, and constitutes the British zillah of Dharwar. It ought, likewise, geographically speaking, to include the small province of Sunda, which, according to the political arrangement of the country, is placed under the zillah of Canara, in the Presidency of Madras."*

"The general boundaries are the rivers Kistnah and Bhima on the north and north-east; the Tungabhadra river on the south; the Nizam's territory on the east, and the Syhadri range of mountains on the west. The latter are generally called the Ghats. . . . . ."

* Since this description was published the boundary of the Dharwar District has been pushed back eastwards and the area referred to in this para. is now part of the Kanara District which will be dealt with in my next Report—R. C. W.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"The general face of this tract is much diversified and affords a great variety of elevation and of geological structure thereby materially affecting the distribution and the habitat of the different species of animals existing within its limits."

"The whole of the western portion is a thick forest, extending from the outskirts of the mountainous region of the Ghats to their summits, and clothing the valleys that extend between their ridges. It abounds with the teak and various other lofty forest trees, festooned by enormous perennial creepers. The bamboo forms a thick and luxuriant underwood in some places, while others are entirely open, and the banks of many clear and rapid streams flowing through it, abound with the black pepper plant, the wild cinnamon and other odoriforous shrubs. Portions of this forest are often left entirely untouched by the axe or knife, forming a thick impervious shade for the growth of the black pepper, cardamom, and Mari palm (*Caryota urens*). These are called 'kans' and are favourite resorts of wild animals."

"To the east of the regular forest lies a tract called the Mulnad, or rain-country (though the native of the plains often includes the 'jhari,' or forest, under the same denomination), in which the trees degenerate into large bushes, the bamboo almost entirely ceases, and cultivation, chiefly of rice, becomes much more frequent. The bushes consists of the karunda, the pallas, etc. It abounds in tanks and artificial reservoirs for purposes of irrigation."

"East of the Mulnad is a great extent of alluvial plain producing fine crops of wheat, cotton, maizes, millet, etc. (*Holcus sorghum*, *Panicum italicum*, *Cicer arietinum*), and on the Nizam's frontier are found a succession of low dry hills, with tabular summits often rising in abrupt scarped precipices, and intersecting and traversing the plains in various directions. They are clothed with low thorny jungle of babul and acacia, and their bases, and the valleys between, composed of a light sandy soil, are cultivated with millet, vetches, etc. (*Panicum spicatum*, *Panicum miliare*, *Phaseolus max*, *Phaseolus mungo*, *&c.*)."

"The first or mountainous division consists chiefly of micaceous clay, and other schists, which to the northward are succeeded by

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

basaltic or trap formation. The Mulnad is composed of undulating clay-slate hills, which become covered with basalt to the north. This trap formation extends in a slanting direction from south-west to north-east nearly coinciding with a line drawn from Sadasheaghur on the coast, to Beejapoor and Sholapoor—and, what is remarkable, is almost coincident with that marking the separation of the two great tribes of the population using totally distinct languages—the Mahrattas and Canarese."

"The hills to the north-east and east are all of primitive sandstone, sometimes resting on schists, sometimes immediately on the granite, which latter is the rock nearest the surface in the central and eastern plains. But a well defined range of hills to the south-west, called the Kupputgud, is entirely composed of micaceous and clay-slates, resting on granite. The hills more to the north and north-west are basaltic. The extensive plains lying between these different lines of hills and eminences are composed of the rich, black mould, called regur, or cotton ground, resulting from decomposed basaltic rocks. To the north-east a considerable tract of limestone is found, resting on the sandstone, about Bagalkote, Badami Hungund, Mudibihsal, etc. . . . "

Mr. Shortridge has furnished the following short notes on the actual localities in which he collected:—

"Dharwar—Chiefly red Mulnad country, except to the north, where there are large areas of black cotton soil. Flat or undulating with a few bare rocky hills to the east. Those on the west being more or less covered with scrub which gradually changes into forest as the Kanara border is approached. Large areas under cultivation. Altitude 2,500 feet."

"The prolific results of the collections throughout the district are largely due to the active and invaluable assistance received from Mr. R. M. Phillips, D.S.P., whose guest I was during the whole of my two months' stay in Dharwar, while many thanks are also due to Mr. E. Macconochie, I.C.S., the Collector of the District, for his kindness and help, particularly in instructing and causing the native officials in all of the places I visited to give me a great deal of assistance."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"Alnavar and Avatgi—About 24 miles west of Dharwar, on the borders of North Kanara. Red soil and where there is no cultivation thick Mulnad scrub or partly open country covered with long grass. A number of hills, largely covered with teak and other forest trees. Altitude about the same as Dharwar.

"Short camps only were made at these places."

"Devikop—26 miles south of Dharwar. On the borders of the Kanara forest which starts abruptly on it, south and west of the village. Flat or slightly undulating with chiefly open and cultivated country to the north and north-east. Altitude 2,000 feet."

"Gadag and Lakundi—Although Gadag itself is situated on a patch of red soil the district proved a perfect centre for working the black cotton country which extended in flat and almost treeless areas in every direction, only broken in the south by a few distinct ranges of rocky hills. Cotton is grown over the whole country while the few scattere trees are mostly babul which fringe the roads forming not very shady avenues. The chief cover for any of the larger animals being stray patches and hedges of prickly pear.

"I stayed here for nearly a fortnight with Mr. T. J. Spooner, a keen and enthusiastic life member of the Society, and owing to his help and knowledge of the country I was able to get a very representative collection from the black cotton district."

Hawsbhavi—About 15 miles to the west of Bayadi Station in the Southern Dharwar District, open, undulating red sandy country in all directions, with scattered babul trees and toddy palms, patches of black cotton country to the north and some low ranges of rocky hills to the east.

"Large areas under cultivation, many of the villages surrounded by mango trees, cocoanut and areca palms.

"I camped here for ten days, afterwards moving on to Tillevelly, a neighbouring village."

"Honkan—A small village situated on the banks of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Varadi river, a permanently running clear stream that eventually joins the Tungabhadra.

"At this point the river forms the boundary between the Dharwar District and north-western Mysore.

"The country is quite flat and covered with very dense scrub jungle, largely composed of low deciduous trees, thick masses of Karunda and other bushes which are curiously even in height.

"The country to the east and the Mysore territory on the south bank of the river are more open, leading eventually to black cotton plains. One of the most curious things noticed here was the frequent occurrence of the black buck well within the thickest parts of the jungle which afford cover for its much more natural inhabitants, chital, pig and four-horned antelope, while on one occasion during a beat I witnessed the unusual sight of a number of chital and black buck simultaneously crossing a road running through the centre of a particularly large and thick piece of jungle."

"Samasgi—About twelve miles to the north of Honkan situated at the point where the three territories of Southern Dharwar, Mysore and Kanara meet.—. . . . . Samasgi which is a small native village is situated in high deciduous forest which surrounds it on all sides.

"There are isolated patches of cultivation and many dense lantana thickets. Undulating, almost hilly country, the forest being similar to those around Devikop."

The collection contains in all 749 specimens, belonging to 51 species, in 40 genera. In view of the whole-hearted way in which the Mammals of this District were worked over 70 years ago, by Sir W. Elliot, it is not surprising to find that there is nothing "new" in the present collection. This does not, however, detract from its great value, for it furnishes us with topotypes of no less than 8 species, named by Gray, &c., on specimens obtained by Elliot. These are as follows: (1) *Hipposideros fulvus*, Gray (=*murinus*, Gray=*fulgens*, Elliot=*murinus*, Elliot). (2) *Pachyura nigra*, Horsfield. (3) *Mus manei*, Gray (nom. nud.). (4) *Leggaad*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

booduga, Gray (=*Mus lepidus*, Elliot). (5) *Epimys rufescens*, var.=*Mus rufus*, Elliot=*Mus flavescens*, Elliot (both names preoccupied). (6) *Millardia meltada*, Gray (=*Mus mutade*, Elliot=*Mus lanuginosus*, Elliot). (7) *Gunomys kok*, Gray (=*Mus* (*Neotoma*) *providens*, Elliot). (8) *Golunda ellioti*, Gray (=*Mus golundi*, Elliot=*Mus hirsutus*, Elliot).

Out of the list of 58 species (really 56 for *H. fulvus* and *Epimys rattus* are entered under two names) recorded by Sir W. Elliot, Mr. Shortridge has obtained 51; those not obtained are mostly large animals from the heavy forest country now forming the Kanara District. As Mr. Shortridge notes "four species mentioned by Sir W. Elliot, *viz.*, *Boselaphus tragocamelus*, *Cynœlurus jubatus*, *Canis pallipes* and *Hyœna hyœna* are now either entirely absent in the Dharwar District or rare stragglers south of Haidarabad."

Mr. Shortridge has taken a single specimen of the Common five-striped Squirrel (*Funambulus pennanti*) at Dharwar. This is somewhat of a surprise to me. I have taken it with the Palm Squirrel in Surat District, while Mr. Crump has sent them both from Nimar and Berar, and both occur in Bombay Island, so that we must, on the data available, accept 22° Lat. as about the northern boundary of *palmarum*. *F. pennanti* has been obtained by Capt. Whitehead at Sehore, by Mr. Caccia, I.F.S., at Hoshangabad and by the Society from Nasik, so that, until the present specimen turned up, the most southern record was about 20° N. Lat., and this is what one would expect, allowing for a slight overlap in the distribution of the two species. Perhaps some members who are favourably placed will push this enquiry further and report their results in the Journal. *F. palmarum* is at once recognisable by the bright red-yellow colouring of the under side of the tail and the presence of only three pale stripes on the back. In *F. pennanti* there are five pale stripes, though the outer one, on each side, is sometimes not very bright, and there is never any trace of colour on the under side of the tail.

In his List Sir W. Elliot includes *Mus decumanus*, unfortunately without any indication of its characters, so that it is impossible to say to what animal he was referring; that it was really the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

European Brown Rat seems to me an absolute impossibility. From the vernacular name given by Elliot his *decumanus* was a house rat.

SIMIA SINICA, L.

The Bonnet Monkey.

1771. *Simia sinica*, Linnæus. Mantissa, p. 521.
1812. *Cercocebus radiatus*, Geoffroy. Ann. du Mus. XIX, p. 98.
1888. *Macacus sinicus*, Blanford. Mammalia, No. 10.
♂ 107, 109; ♀ 108, 110. Dharwar.
♂ 142; ♀ 143. Devikop, Dharwar.
♂ 749, 750; ♀ 751, 752, 753, 754. Samasgi, S. Dharwar.

Vernacular names.—Kóti, Kapi, Mangá, Maungyá, Kempmangá (Kanarese); Mákad Lál mangá (Marathi); Mángya-Kóti (Haran Shikaris and Waddars); Bandra (Dekhani).

["Very plentiful; often going about in large parties of from 20 to 30. Although said to avoid each other, I once saw troupes of these Monkeys and Langurs on the banks of a stream, apparently mixing together on quite friendly terms, but, when frightened, they went off separately.

"At Gadag, in the vicinity of Hindu Temples, where they are protected, they are said to have died, in large numbers, from Bubonic Plague."—G. C. S.]

PRESBYTIS HYPOLEUCOS, Blyth.

The Malabar Langur.

1841. *Semnopithecus hypoleucos*, Blyth. J.A.S.B., p. 839.
1842. *Semnopithecus dussumieri*, Is. Geoffroy. Comptes Reudus. XV, p. 719.
1888. *Semnopithecus hypoleucus*, Blanford. Mammalia, No. 15.
♂ 52; ♀ 47. Alnavar, Dharwar.
♂ 145, 146, 147, 183, 185; ♀ 148, 186. Devikop, Dharwar.
♂ 714, 717 juv.; ♀ 715, 716 juv. Hawsbhavi, S. Dharwar.
♂ 747, 748, 781, 791, 792; ♀ 744, 745, 746, 793. Samasgi, S. Dharwar.

This species was named by Blyth from the Malabar Coast; the present series seems to fit his description.

Vernacular names.—Mushya, Kari-Kóti, Adavi-Koti (Kanarese); Yerpa-Moti-Koti, Karimíkkamungyá (Waddars) Kari-Mangyá (Haran Shikaris) Wánga, Wánar, Maka (Marathi); Langúr (Dekhani).

["Extremely plentiful; generally fearless and inquisitive, easily distinguishing between Europeans and Natives, and much more suspicious in the presence of the former. When frightened they can crouch among the tops of thick trees, and by grasping and drawing branches together, become completely hidden."—G. C. S.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PTEROPUS GIGANTEUS, Brünn.

The common Flying-Fox.

(Synonymy in No. 2.)

♂ 53, 55, 56, 57, 59, 60, 73 ; ♀ 54, 58, 72. Avatgi, Dharwar.

♀ 125, 126, 127, 128, 129, 130. Devikop, Dharwar.

♂ 707, 711, 719, 720 ; ♀ 577, 579, 580, 712 (in al.), 713. Hawsbhavi, S. Dharwar.

♂ 731. Honkan, S. Dharwar.

(*See* also Reports Nos. 2, 3 and 4.)

Vernacular names.—Togal-Bávali, Kíchapála, Bávali (Kanarese) ; Wadwágal (Marathi) ; Toggal-Bávali-Gua, Sikattélle (Waddars), Gaddal, Gíbta (Haran Shikaris).

["Very plentiful, around Dharwar, at this time of the year; they feed chiefly on tamarinds and wild figs.

"Appearing to avoid thick forests."—G. C. S.]

LYRODERMA LYRA, Geoffr.

The Indian Vampire Bat.

(Synonymy in No. 1.)

♂ 131, 133, 188, 194, 195 ; ♀ 132, 156, 160, 187, 189, 196, 197, 198, 199, 200, 201, 202, 203. Devikop, Dharwar.

♀ 732 (in al), 735. Honkan, S. Dharwar.

♀ 803. Hangal, S. Dharwar.

(*See* also Reports Nos. 1 and 2.)

These specimens, like those from E. Khandesh, come from the geographical boundary (about 76° E. Long.) between true *lyra* and the subspecies *caurina* which differs mainly in size. A very large proportion of the present series is undoubtedly true *lyra*, but, as was to be expected, there are some "wrong 'uns." One specimen has the dimensions of *caurina* and two are intermediate between it and true *lyra*.

["This bat, which is plentiful in both forest and Mulnad country, is a late flyer.

"I have found it by day in wells and old temples and once in a hollow tree."—G. C. S.]

MEGADERMA SPASMA TRIFOLIUM, Geoff.

The Malay Vampire Bat.

1810. *Megaderma trifolium*, Geoffroy. Ann. Mus. d'H.N. XV, p. 193.

1863. *Megaderma horsfieldi*, Blyth. Cat. Mamm., p. 23.

1891. *Megaderma spasma*, Blanford. Mammalia, No. 170.

♂ 739, 741 ; ♂ 738, 740 (in al.) juv., 742. Honkan, S. Dharwar

The true *spasma* is an inhabitant of the Moluccas and Philippines ; the present form was first described from a specimen from Java.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

RHINOLOPHUS ROUXI, Temm.

The Rufous Horseshoe-Bat.

1835. *Rhinolophus rouxi*, Temminck. Mon. Mamm. II., p. 30 b.
1852. *Rhinolophus rubidus*, Kelaart. Prodr. Faun. Zeyl., p. 13.
1852. *Rhinolophus cinerascens*, Kelaart. l. c.
1852. *Rhinolophus rammanika*, Kelaart. l. c., p. 14.
1872. *Rhinolophus petersi*, Dobson. J. A. S. B. XLI (2), p. 337.
1891. *Rhinolophus affinis*, Blanford. Mammalia, No. 150.
♂ 135, 137, 139, 174, 177; ♀ 134, 136, 138, 140, 141, 178, 179, 180, 181. Devikop, Dharwar.

Blanford ranks *rouxi* as a synonym of *affinis*, but Dr. K. Andersen has pointed out (P. Z. S. 1905, p. 75 *et seq.*) that the form of the nose-leaf in the two is entirely different. In the same paper Dr. Andersen has gone fully into the name *petersi* and shown it to be a synonym of *rouxi*, and further has shown that Kelaart's three names represent the "colour phases" of one species and that one identical with *rouxi*.

Vernacular names (for all small bats.)—Kanakappadi, Kanakappate, Kankappate (Kanarese); Wágal (Marathi); Koptel, Sancípta (Waddars and Haran Shikaris).

["Plentiful at Devikop; a late flyer, roosting by day in hollow trees, wells and in old temples."—G. C. S.]

HIPPOSIDEROS DUKHUNENSIS, Sykes.

Sykes' leaf-nosed Bat.

1831. *Rhinolophus dukhunensis*, Sykes. P. Z. S., p. 99.
1838. *Hipposideros apiculatus*, Gray. Mag. Zool. Bot. II, p. 492.
1838. *Hipposideros penicillatus*, Gray. l. c.
1852. *Hipposideros templetonii*, Kelaart. Prod., p. 17.
1852. *Hipposideros aureus*, Kelaart. Prod., p. 18.
1852. *Hipposideros blythii*, Kelaart. Prod., p. 20.
1891. *Hipposiderus speoris*, Blanford. Mammalia, No. 164.
♂ 320, 321, 323, 324, 325, 326, 327, 328, 333, 358, 359; ♀ 317, 318, 319, 322, 329, 330, 331, 332, 334, 335, 336, 360, 361 (in al.), 343, 344, 345, 346, 347, 348, 349, 350. Gadag, Dharwar.

The name *speoris* was given by Schneider to a bat from Timor. I have seen no specimen from that locality, but both Sykes and Gray agree that the Indian form is separable. The names available are *dukhunensis*, Sykes, and *apiculatus* and *penicillatus*, Gray. These specimens are quite like the type of *apiculatus* of which they are topotypes. Though I have not seen an undoubted specimen of *dukhunensis*, its type locality is so close to Dharwar that, pending refutation, *dukhunensis* must be accepted as the proper name of the species.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HIPPOSIDEROS FULVUS, Gray.

The bicoloured leaf-nosed Bat.

(Synonymy in No. 3.)

♀ 245. Dharwar.

♂ 446; ♀ 403, 447, 448, 449, 451, 452, 453, 454, 455, 456. Gadag, Dharwar.

These are topotypes of Elliot's *murinus* and *fulgens*, the latter being merely the red phase of the former, and equally so of Gray's *fulvus* and *murinus*.

(*See* also Report No. 3.)

PIPISTRELLUS CEYLONICUS, Kel.

Kelaart's Pipistrelle.

(Synonymy in No. 1.)

♂ 42, 44, 46, 77, 86, 87, 98, 386, 387, 389, 390, 392, 395, 398, 411; ♀ 41, 43, 45, 67, 83, 84, 85, 96, 97, 99, 246, 384, 385, 391, 393, 394, 396, 397, 399, 412. Dharwar.

(*See* also Reports Nos. 1, 2 and 3.)

["Very plentiful in a Hindu Temple at Gadag, hiding in crevices."—G.C.S.]

PIPISTRELLUS COROMANDRA, Gray.

The Coromandel Pipistrelle.

1838. *Scotophilus coromandra*, Gray. Mag. Zool. Bot. II, p. 498.

1851. *Vespertilio coromandelicus*, Blyth. J. A. S. B. XX, p. 159.

1853. *Myotis parvipes*, Blyth. J. A. S. B. XXII, p. 581.

1872. *Vesperugo micropus*, Hutton. P. Z. S., p. 707.

1891. *Vesperugo abramus*, Blanford. Mammalia No. 187.

♂ 703. Hawsbhavi, S. Dharwar.

♂ 775, 783; ♀ 773, 807, 808. Samasgi, S. Dharwar.

Temminck's names *imbricatus* and *abramus* refer to species found in Java and Japan respectively. Gray based his *coromandra* on the "Vespertilio de Coromandel" described by F. Cuvier from a specimen taken at Pondicheri. The names *parvipes* and *micropus* were both based on a Pipistrelle taken by Hutton at Masuri, it is quite possible it may prove to be distinct from the present form.

PIPISTRELLUS DORMERI, Dobs.

Dormer's Pipistrelle.

(Synonymy in No. 1.)

♂ 588. Hawsbhavi, S. Dharwar.

(*See* also Reports Nos. 1, 2 and 3.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PIPISTRELLUS MIMUS, Wrought.

The Southern dwarf Pipistrelle.

(Synonymy in No. 1.)

♂ 218, 571 (in al.). Dharwar.

♀ 316 (in al.). Gadag, Dharwar.

♂ 589, 59⁰, 591 ; ♀ 592, 721. Hawsbhavi, S. Dharwar.

(*See* also Reports Nos. 1, 2 and 3.)

HESPEROPTENUS TICKELLI, Blyth.

Tickell's Bat.

1857. *Nycticejus tickelli*, Blyth. J. A. S. B. XX, p. 157.

1857. *Nycticejus isabellinus*, Horsefield. Cat. Mamm., p. 38.

1891. *Vesperugo tickelli*, Blanford. Mammalia No. 191.

♂ 811, 812; ♀ 776, 798, 799, 805, 810. Samasgi, S. Dharwar.

Horsfield in his Catalogue gave the name *isabellinus* on the authority of a manuscript name of Blyth's, fortunately Blyth, had already published the name *tickelli* before the Catalogue appeared. The two names therefore refer to the same animal whose type locality is Chaibasa "in Central India" (or more correctly Cuttack).

SCOTOPHILUS KUHLI, Leach.

The common yellow Bat.

(Synonymy in No. 1.)

♂ 17, 458 ; ♀ 34, 82. Dharwar.

♀ 772, 806. Samasgi, S. Dharwar.

(*See* also Reports 1 and 3.)

["Plentiful; an early flyer, coming out at the same time as *Pipistrellus*."—G. C. S.]

SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat.

(Synonymy in No. 1.)

♂ 217 ; ♀ 404. Dharwar.

(*See* also Report No. 1.)

TYLONYCTERIS PACHYPUS, Temm.

The club-footed Bat.

1840. *Vespertilio pachypus*, Temminck. Mon. Mamm. II, p. 217.

1859. *Scotophilus fulvidus*, Blyth. J. A. S. B. XXVIII, p. 293.

1891. *Vesperugo pachypus*, Blanford. Mammalia No. 180.

♀ 743. Honkan, S. Dharwar.

♀ 782. Samasgi, S. Dharwar.

The type locality of *pachypus* is Java, while *fulvidus* was established by Blyth on a specimen from Tenasserim.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE PAINTED BAT, KERIVOULA PICTA, PALLAS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

KERIVOULA PICTA, Pall.

The painted Bat.

1767. *Vespertilio pictus*, Pallas. Spicil. Zool. III, p. 7.

1891. *Cerivoula picta*, Blanford. Mammalia No. 213.

♂ 11; ♀ 28. Dharwar.

The type came from Ternate in the Molucca Archipelago: the present specimens differ somewhat from the type, which is in the National Collection, but the material is not sufficient on which to base a strict diagnosis.

["Said to hide by day among thick foliage, clinging to the under side of leaves, where their bright colours would have a protective resemblance to dead leaves.

"Apparently very widely distributed, although somewhat rare everywhere.

"The brilliant orange of the wing membranes fades almost immediately after death. This colour seems to vary in shade in individuals from Java." —G.C.S.]

RHINOPOMA HARDWICKII, Gray.

The lesser Indian mouse-tailed Bat.

(Synonymy in No. 3.)

♂ 386, 369. 370, 373, 428; ♀ 357, 371, 372, 427. Gadag Dharwar.

(*See* also Report No. 3.)

["Fairly plentiful in old Hindu Temples at Gadag and Lakundi, sometimes found in company with *Hipposideros dukhunensis* although not in such large numbers. All were enormously fat, especially this species, in which it is manifested in the form of swellings at the root of the tail present in both sexes, but more particularly in the males. At certain times of the year these swellings are developed to such an extent as to interfere with the flight of the bats."—G.C.S.]

NYCTINOMUS TRAGATUS, Dobs.

Dobson's wrinkle-lipped Bat.

(Synonymy in No. 3.)

♀ 383. Gadag, Dharwar.

(*See* also Report No. 3.)

PACHYURA.

Shrews.

♂ 7, 19, 251, 286; ♀ 212, 287. Dharwar.

♂ 418, 442. Gadag, Dharwar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♂ 573; ♀ 574, 575, 598. Hawsbhavi, S. Dharwar.
♂ 727, 733; ♀ 734. Honkan, S. Dharwar.
(*See* also Reports 1, 3 and 4.)

Vernacular names.—Múgili, Sundili, Sondili, Chichikili (Kanarese); Chichandári (Marathi); Sóndi, Sondiyelka (Waddars and Haran Shikaris).

["Fairly plentiful around stables and outhouses, widely distributed, though apparently not in great numbers."—G.C.S.]

PACHYURA NIGRA, Horsf.

The Nilgiri Wood Shrew.

1851. *Sorex niger*, Horsfield. Cat. E. I. C. Mus., p. 135.
1888. *Crocidura murina*, Blanford. Mammalia No. 117 (partim).
♀ 220. Dharwar.

This is a topotype of Elliot's *Sorex niger* which was never published. Horsfield quoted it from Elliot's Manuscript and gave a short description; the name stands therefore on Horsfield's responsibility. Whether the name will stand for the species ultimately must be left for decision when more material is available, but for the present we are on firm ground in adopting for it the name *nigra*.

FELIS PARDUS, L.

The Panther.

1766. *Felis pardus*, Linnæus. Syst. Nat., p. 61.
1775. *Felis leopardus*, Wagner. Schreb. Saug. III, pl. ci.
1888. *Felis pardus*, Blanford. Mammalia, No. 30.
♂ 726. Hawsbhavi, S. Dharwar.
♀ 801. Samasgi, S. Dharwar.

Vernacular names.—Kiraba, Hongiya, Chirate, Chirchu, Sannhuli (Kanarese); Chíta-Wagh, Chíta-Bágh, Bíbta, Hasánya (Marathi); Kírrbah, Kurrkuda (Haran Shikaris); Chóta-Bágh, Théndwa (Dekhani).

FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)
♂ 78, 240, 469; ♀ 22, 224, 470, 471, 474. Dharwar.
(*See* also Reports Nos. 1, 3 and 4.)

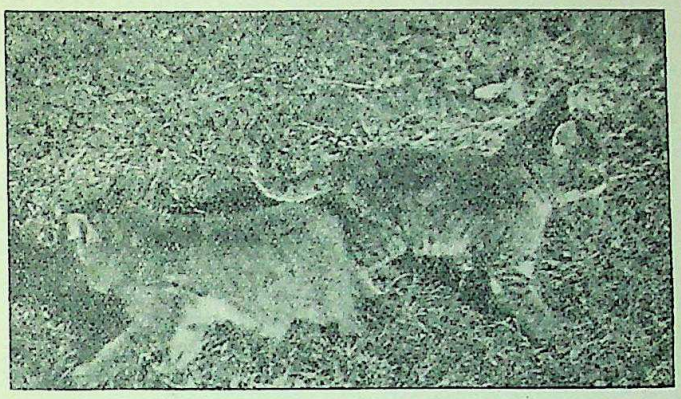
Vernacular names.—Kádubekku, Mántbekku, Adávibekku (Kanarese); Júngli Mániar (Marathi); Burakátchki (Haran Shikaris); Júngli-billi (Dekhani).

["Very plentiful; hunts a lot by day. Its long legs give it a very distinctive appearance, in the open its movements are very much like those of a small panther. Very swift and exceedingly strong for its size; it is probably capable of bringing down quite large game. Kittens become

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tame quickly, although never to the same extent as those of a domestic cat. They become perfectly fearless, although remaining amusingly savage, especially at feeding time."—G. C. S.]



Kittens of the Jungle Cat.

FELIS RUBIGINOSA, Geoffr.

The rusty-spotted Cat.

1834. *Felis rubiginosa*, Is. Geoffroy. Belanger Voy. Ind. Or., p. 141.

1888. *Felis rubiginosa*, Blanford. Mammalia No. 37.

♂ 21. Dharwar.

Vernacular names.—Kiraba-Bekku (Kanarese); Ark-Phílli (Waddars).

["Apparently rare round Dharwar."—G. C. S.]

VIVERRICULA MALACCENSIS, Gmel.

The small Indian Civet.

(Synonymy in No. 3.)

♂ 79, 100, 285, 291, 472, 473; ♀ 8, 226, 241. Dharwar.

♂ 182. Devikop, Dharwar.

(*See* also Report 3.)

Vernacular names.—Punagina-Bekku (Kanarese); Jowádi-Mánjur (Marathi); Puluk-Phílli (Waddars); Punkassibekk (Haran Shikaris); Múshak-bílli (Dekhani).

["Plentiful; the large number of small carnivora around Dharwar may account for the comparative scarcity of hares and game birds, although their chief food probably consists of *Tatera* and the other field-rats, which exist in such enormous numbers."—G. C. S.]

MUNGOS MUNGO, Gmel.

The common Indian Mongoose.

(Synonymy in No. 1.)

♂ 9, 71, 476; ♀ 101, 102, 225, 475, 477, 482, Dharwar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♂ 648; ♀ 677. Hawsbhavi, S. Dharwar.

(*See* also Reports 1, 2, 3 and 4.)

Vernacular names.—Múngali, Mungili (Kanarese); Mungús (Marathi and Dekhani); Múngsi, Antúr (Waddars and Haran Shikaris).

["Plentiful; their burrows are frequently found in prickly pear thickets, numerous broken off spines of that plant being often found imbedded in their bodies. Although seldom leaving the ground, this species is a ood and agile tree climber."—G. C. S.]

PARADOXURUS NIGER, Desm.

The Indian Toddy Cat.

1820. *Viverra nigra*, Desmarest. Mamm., p. 208.
1820. *Viverra bondar*, de Blainville. Mamm., p. 210.
1821. *Paradoxurus typus*, F. Cuvier. Hist. Nat. Mamm., pl. 186.
1832. *Paradoxurus pennanti*, Gray. P. Z. S. p., 65.
1835. *Platyschista pallasii*, Otto. Ac. C. d. Nov. Act. XVII, p. 1089.
1891. *Paradoxurus nictitans*, Taylor. Jour. B. N. H. S., Vol. VI, p. 429.
1888. *Paradoxurus niger*, Blanford. Mammalia, No. 51.

♂ 50; ♀ 49, 51. Alnavar, Dharwar.
♀ 184, 242, 243, 247, 292. Dharwar.
♂ 708. Hawsbhavi, S. Dharwar.
♀ 768, 769. Samasgi, S. Dharwar.

This is a most puzzling species to deal with; it seems to have several colour forms but they are not also local forms, any or all of them may be found in any locality, including Zanzibar, Madagascar (?), Mauritius, &c., where they have been introduced. The only safe course is to call them all *niger*.

Vernacular names.—Kerabekku (Kanarese); Menuri (Marathi and Dekhani); Nulla-phílli (Waddars); Mahngutchi (Haran Shikaris).

["Plentiful, especially near houses, in the roofs of which they often live, and may be heard at night chasing rats. When caught young this animal becomes tame in a very short time."—G. C. S.]

CANIS INDICUS, Hodgs.

The Jackal.

(Synonymy in No. 1 under *C. aureus*.)

♂ 481; ♀ 284, 294, 484. Dharwar.
♂ 718 juv.; ♀ 608 juv. Hawsbhavi, S. Dharwar.

(*See* also Reports 1, 3 and 4).

Vernacular names.—Nari (Kanarese); Kóla (Marathi and Dekhani); Nákka, Tada Nákka (Waddars).

["Very plentiful both in open and forest country."—G. C. S.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

VULPES BENGALENSIS, Shaw.

The common Indian Fox.

(Synonymy in No. 1.)

♂ 493; ♀ 68, 486. Dharwar.

♂ 122. Devikop, Dharwar.

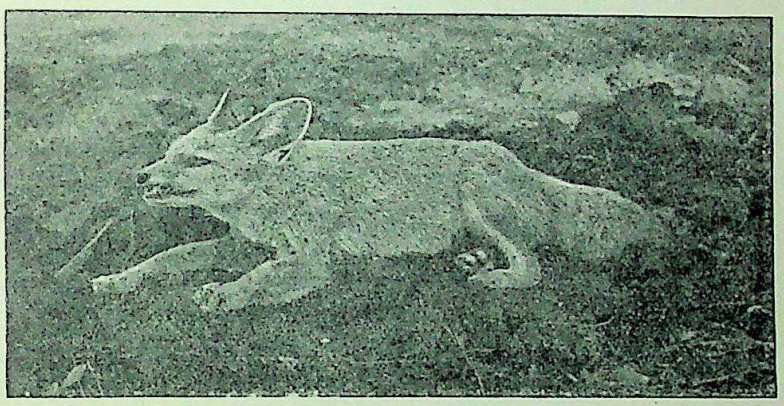
♂ 311. Gadág, Dharwar.

♂ 609. Hawsbhavi, S. Dharwar.

(*See* also Reports Nos. 1 and 3.)

Vernacular names.—Kunní-Nari, Kemp-Nari, Kónk, Chándak-Nari (Kanarese); Lókri kókri (Marathi); Gúnta-Nakka (Waddars).

["Fairly plentiful, chiefly among rocky hills and broken country, often seen in the day-time. This fox is said to be difficult to hunt, except by sight, as it leaves a very slight scent."—G. C. S.]



The common Indian Fox from a photograph.

RATUFA INDICA, Erxl.

The Bombay Giant Squirrel.

1777. *Sciurus indicus*, Erxleben. Syst. Reg. An., p. 420.

1777. *Sciurus purpureus*, Ximmermann. Spec. Zool. Grog. Anad., p. 518.

1785. *Sciurus bombayannus*, Boddaert. Elench. An., p. 117.

1831. *Sciurus elphinstonei*, Sykes. P. Z. S., p. 103.

1891. *Sciurus indicus*, Blanford. Mammalia, No. 239 (partim).

♂ 150, 151, 158, 161, 164, 165, 166, 192; ♀ 149, 157, 163, 191. Devikop, Dharwar.

♂ 784, 786, 788, 789; ♀ 758, 759, 770, 778, 779, 780, 785, 787 Samasgi, S. Dharwar.

Blanford wrote on these squirrels in a paper in our Journal (Vol. XVI, p. 298) and later I dealt with them (Vol. XIX., p. 880.) These specimens are unmistakably *indicus*, which is curious for Mysore specimens, I believe, belong to another of Blanford's races.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Vernacular names.—Kadalale, Kempalale (Kanarese); Tambrikár (Marathi); Bet-urtá (Waddars and Haran Shikaris); Kargilherí, Jungli Gilheri (Dekhani).

["Plentiful in the Forests round Devikop and Samasgi. Very active and rather shy. Where abundant, it soon makes its presence known by it loud call; any sudden noise, such as hitting a tree sharply with a stick, will often start these squirrels calling in all directions.—" G. C. S.]

FUNAMBULUS PALMARUM, L.

The Palm Squirrel.

(Synonymy in No. 2.)

♂ 95, 103, 105; ♀ 6, 104, 106, 214, 250. Dharwar.

♂ 337, 338, 421; ♀ 420. Gadag, Dharwar.

♂ 646, 653, 654, 655; ♀ 611, 616, 661, 662, 687. Hawsbhavi S. Dharwar.

(*See* also Reports 2 and 4.)

Vernacular names.—Alale, Alalu, Inachi, Vúrchi (Kanarese); Kárzáni (Marathi); Úrta (Waddars and Haran Shikaris); Gilehri (Dekhani).

["Very plentiful, occurring everywhere except in the forest country where it is replaced by *F. tristriatus*. Particularly abundant in the neighbourhood of houses—sleeping in the roofs and spending the day in the verandahs and surrounding trees. Its call, which is a loud unmusical chatter, is uttered very frequently; when startled, angry, or in any way excited.

"They may often be found in prickly pear thickets, when their mouths are usually stained crimson with the juice of the fruit. Both this species and *tristriatus* feed also on the berries of the *Lantana*."—G. C. S.]

FUNAMBULUS TRISTRIATUS, Waterh.

The jungle Striped Squirrel.

1837. *Sciurus tristriatus*, Waterhouse. Charl. Mag. N. H. I, p. 499.

1667. *Sciurus* (*Tamias*) *dussumieri*, Milne-Edwards. Rev. Mag. Zool. XIX, p. 226.

1891. *Sciurus tristriatus*, Blanford. Mammalia, No. 254.

♀ 1, 2, 35. Dharwar.

♂ 206; ♀ 124, 176, 205. Devikop, Dharwar.

♂ 774, 777, 814, Skulls only, 794, 795, 796. Samasgi, S. Dharwar.

"Replaces *F. palmarum* in the forest part of the Mulnad. Its call however is distinct, being softer and much more musical."—G. C. S.]

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(Synonymy in No. 1.)

♂ 69. Dharwar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I was much astonished to find this animal in the collection. I was not aware that it came south of Bombay.

(*See* also Reports Nos. 1, 2, 3 and 4).

TATERA INDICA, Hardw.

The Indian Gerbil.

(Synonymy in No. 1.)

♂ 3, 61, 62, 118, 119, 215, 216, 221, 222, 228, 267, 268, 274, 277, 279, 280, 283, 288, 289, 290 ; ♀ 4, 5, 70, 88, 89, 116, 117, 232, 249, 269, 270, 273, 275, 276, 278, 281, 282, 293, 485. Dharwar.

♀ 152, 153, 154, 155, 159. Devikop, Dharwar.

♂ 307, 308, 340 ; ♀ 309, 310, 426. Gadag, Dharwar.

♂ 583, 585, 586, 600, 602, 606, 607 ; ♀ 582, 584, 587, 599, 601, 603. Hawsbhavi, S. Dharwar.

(*See* also Reports Nos. 1, 2, and 4.)

Vernacular names.—Ili (all rats, mice) ; Bilaili, Kádili, Buddílchi (Kanarese) ; Úndir (Marathi) ; Yélka, Yerí-yélka, Ili Yélka (Waddars) ; Júngli-Choua (Dekhani).

["Plentiful everywhere, but most plentiful in red soil country near cultivation, where their rather large burrows are very noticeable, nocturnal. Always numerous among prickly pear thickets and hedges, when they frequently have their mouths and feet stained crimson with the juice of the fruit. Their speed and agility are remarkable."—G. C. S.]

VANDELEURIA OLERACEA, Benn.

The Dekhan Tree-Mouse.

(Synonymy in No. 2.)

♂ 27, 208, 209, 210, 211. Dharwar.

♀ 578. Hawsbhavi, S. Dharwar.

(*See* also Reports 2 and 4.)

Vernacular name.—Malkélka Meinélka (Waddars).

["Apparently not very plentiful around Dharwar. Four young, that were kept alive, were very active, and great climbers. When resting in a bush their tails would generally be curled round a branch."—G. C. S.]

MUS MANEI, Kel.

The common Indian House-Mouse.

1852. *Mus manei*, Kelaart. Prod., p. 64.

1891. *Mus musculus*, Blanford. Mammalia, No. 282 (partim).

♂ 231, 244 ; ♀ 15, 229, 230 (in al.), 252, 253, 254, 255, 256, 257, 258, 259. Dharwar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

296, 298, 299, 341 (in al.), 406, 407, 408, 409, 410, 434, 435, 436; ♀ 297, 302, 342 (in al.), 405. Gadag. Dharwar.

These are topotypes of Gray's *Mus manei*. Unfortunately Gray published no description. In 1852 Kelaart applied the name to a Ceylon Mouse, whose description, as given by him, agrees quite closely with these specimens, except that the size quoted is rather small. Until specimens from Ceylon are available to show that they are distinct, I propose to use the name *manei* for the House-Mouse at any rate of Southern India. Kelaart points out that its longer tail, darker colour, and white toes differentiate it from *Mus musculus*.

["Particularly plentiful round Gadag. In the Dharwar District generally this species is not so generally distributed as *Epimys rufescens*. It appears to be quite absent in many villages and is never found at any distance from human habitations."—G. C. S.]

LEGGADA PLATYTHRIX, Sykes.

The Dekhan Spiny-Mouse.

(Synonymy in No. 1.)

♂ 13, 467, 468; ♀ 14, 30, 36, 37, 38, 39, 266, 271. Dharwar.

♀ 429. Gadag, Dharwar.

♂ 572, 597, 612, 623, 625, 627, 628, 649, 673, 674, 682; ♀ 596, 613, 614, 615, 624, 626, 629, 630, 650, 651, 675, 683, 686. Hawsbhavi, S. Dharwar.

♂ 728, 729. Honkan, S. Dharwar.

(*See* also Reports Nos. 1, 2 and 4.)

Vernacular names.—Léggádé (Waddars).

["Plentiful, often living among piles of loose stones or rocks. In open country it throws a collection of small stones round the entrance to its burrow, which recalls *Mus albocinereus* of the sandy districts of Western Australia, which constructs a small circular net work of sticks round its hole, to prevent sand from blowing in and choking it up. Elliot however notes that *Leggada platythrix* frequently closes the entrance to its burrow."—G. C. S.]

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

(Synonymy in No. 1.)

♂ 12, 29, 31, 219, 227; ♀ 32, 33, (in al.), 264, 265. Dharwar.

♂ 315, 362, 376, 379, 419, 430, 432, 439, 440, 441, 443, 444, 445, 488, 497, 498; ♀ 377, 378, 400, 431, 433, 437, 438, 495, 496, 497, 499, 500, 501, 502, 503 (in al.), 489, 490. Gadag, Dharwar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♂ 595, 632, 658, 660, 709 ; ♀ 581, 656, 657, 693 (in al.), 633 to 645, 663, 665, 666, 667. Hawsbhavi, S. Dharwar.

The Dharwar specimens are topotypes of Gray's *booduga*, which was based on specimens sent by Elliot.

(*See* also Reports Nos. 1, 2 and 4.)

Vernacular names.—Budúga (Kanarese) ; Chíttagand, Chíttayelka (Waddars).

["Very plentiful everywhere, especially in cultivated country."—G. C. S.]

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

♂ 20, 26, 114, 213 ; ♀ 113, 115, 121, 272. Dharwar.

♂ 112 ; ♀ 168, 169, 170. Devikop, Dharwar.

♂ 303, 306, 367 ; ♀ 300, 301, 304. Gadag, Dharwar.

♂ 460 ; ♀ 461. Hubli, Dharwar.

♂ 698. Hawsbhavi, S. Dharwar.

♂ 755, 763 ; ♀ 756, 757, 764. Samasgi, S. Dharwar.

VARIETY with white underparts.

♂ 16, 25, 120, 234, 235, 236, 237, 238, 239 ; ♀ 24, 111, 233. Dharwar.

♂ 459. Hubli, Dharwar.

♂ 576, 621, 622, 689, 691 ; ♀ 688, 690, 692, 723. Hawsbhavi, S. Dharwar.

♂ 765 ; ♀ 761, 762. Samasgi, Dharwar.

(*See* also Reports Nos. 1, 2, 3 and 4.)

Vernacular names.—Ili (all rats, Kanarese) ; Úndír (all rats, Marathi) ; Intyelka (Waddars) ; Chouá (all rats, Dekhani).

Hitherto all the specimens dealt with in these Reports have been uniformly characterised by dark underparts, whereas in this collection the majority are white below.

There has been at one time or another much discussion as to the taxonomic value of the belly colour in this very variable species.

Capt. Lloyd, I.M.S. (Records Ind. Mus. Vol. III, Part 1, page 92, 1909) writes : "White-bellied rats form a pure race in Rangoon ; they are common in Calcutta. Out of 69 villages in the Punjaub it was found that only 3 contained them in small numbers." And again : "It cannot be doubted that the commonest type of *Mus rattus* in India is the dark-bellied one, and that the white-bellied type occurs sporadically." In the Malay Peninsula, Siam and the islands of the Malay Archipelago the dark-bellied type forms only an insignificant portion of the whole.

Two parallel forms occur in Egypt, and Mr. L. Bonhote has been carrying out breeding experiments with these. Some of his recent results

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

are recorded in P. Z. S., 1912, page 6: "With regard to the heredity of the two normal varieties, the white-bellied form (*M. r. tectorum*) was found to be apparently a simple Mendelian dominant to the dark-bellied form (*M. r. alexandrinus*), the dark-bellied ones always breeding true and the heterogeneous light-bellied ones giving a proportion of pure *alexandrinus*."

According to Mr. Bonhote's results there can be no "intermediates" (*i.e.*, in the outward appearance) between the dark-bellied and white-bellied forms. Amongst these Dharwar specimens in the large majority of white-bellied individuals the belly is pure white, marked off from dark back colour by a well defined line, but in one or two this sudden transition from dark to white is absent, and over more or less the whole of the under surface the bases of the hairs are grey.

Amongst the *Chiroptera* and especially amongst the *Rhinolophidæ* it is well known that colour "phases" constantly occur, and these perhaps are analogous to these forms of *rufescens*.

For the present I propose to list the white-bellied form merely as a "variety" of *rufescens*, as the course at once the safest and most convenient.

This white-bellied variety is undoubtedly the *rufus* and *flavescens* of Elliot, but both names are preoccupied; should a name be at any time required, *arboreus*, Buchanan Hamilton, is available and most apposite. Kelaart calls the corresponding animal in Ceylon "The white-bellied tree Rat."

Nos. 689, 690, 691, 692 above are representatives of the "sport" with a white spot on the forehead for which Capt. Lloyd has inadvertently established the name *brahminicus*; all four are quite young and evidently belong to the same litter.

MILLARDIA MELTADA, Gray.

The soft-furred Field-Rat.

(Synonymy in No. 1.)

♂ 10, 18, 40; ♀ 462 (in al.), 463, 464, 465, 466. Dharwar.

♂ 314, 339, 375, 401, 415, 416, 422, 424, 479, 480, 504; ♀ 374, 413, 414, 423, 425, 478, 487, 491, 492, 494 (in al.), 402. Gadag, Dharwar.

The Dharwar specimens are topotypes of Elliot's *M. lanuginosus* as well as of *Mus meltada*, Gray.

(*See* also Reports Nos. 1 and 3.)

Vernacular names.—Mettada, Mettad Illi (Kanarese); Mettanyélka, Mettad (Waddars).

["Confined, almost, if not entirely, to black soil country, where it is probably chiefly destructive to cotton crops. These rats, in favourable seasons, increase in such enormous numbers as to eat down the crops of an

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

entire district. While at Dharwar I never found the species so plentiful as *Tatera* or *Gunomys*, although there is no doubt that at times it becomes a plague."—G.C.S.]

GUNOMYS KOK, Gray.

The Southern Mole-Rat.

(Synonymy in No. 1.)

♂ 23, 66, 91, 260, 261; ♀ 63, 64, 65, 90, 92, 93, 262, 263. Dharwar.

♂ 173, 175; ♀ 162, 171, 172. Devikop, Dharwar.

♂ 351, 354, 355, 364, 380, 381, 382, 450; ♀ 305, 352, 353, 356, 363, 365, 366, 417. Gadag, Dharwar.

♂ 605; ♀ 604, 620, 685. Hawsbhavi, S. Dharwar.

(*See* also Reports 1 and 4.)

Vernacular names.—Kóka, Illkóka (Kanarese); Urpunigoóka (Haran Shikaris).

["Although not in quite such enormous numbers as *Tatera*, this species probably comes second here as a destroyer of crops. Occurs everywhere both in open cultivation, and the thickest forest; its existence being always indicated by the mole-hill like mounds which it throws up. They are extremely savage and when in confinement will jump at, and attempt to bite, anything that comes near them, at the same time giving a series of angry grunts."—G. C. S.]

BANDICOTA MALABARICA, Shaw.

The Malabar Bandicoot.

1801. *Mus malabaricus*, Shaw. Gen. Zool., p. 54.

1839. *Mus (Neotoma) giganteus*, Elliot. Madr. Jour. Land. S., p. 209.

1891. *Nesocia bandicota*, Blanford. Mammalia No. 296 (partim).

♂ 144, 190, 193; ♀ 167, 204. Devikop, Dharwar.

♀ 223. Dharwar.

♀ 760, 771, 813. Samasgi, S. Dharwar.

These certainly represent Elliot's *Neotoma gigantea*, but they seem most like the Travancore form. Compare my paper on the Bandicoots in this Journal (Vol. XVIII, p. 747).

Vernacular names.—Heggana (Kanarese); Ghús, Ghoús (Marathi and Dekhani); Phersakóka (Waddars).

["Chiefly frequenting stables and outhouses, where they are said to be very destructive in undermining floors. The habits of the Java Bandicoot were entirely different, it lived in rice fields and was fond of water.

This rat (as well as *Funambulus*, *Tatera* and even *Simia*) is said to be very liable to bubonic plague, and occasionally to be found dead in numbers from that cause.'—G. C. S.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

GOLUNDA ELLIOTI, Gray.

The Indian Bush Rat.

(Synonymy in No. 1.)

♂ 248. Dharwar.

♂ 593, 617, 619, 659, 664, 669, 671, 676, 680, 694, 700, 701, 702, 710 ; ♀ 594, 610, 618, 631, 652, 668, 669, 670, 672, 678, 679, 681, 684, 695, 696, 697, 699, 704, 705 (in al.). Hawsbhavi, S. Dharwar.

♂ 766 ; ♀ 767. Samasgi, S. Dharwar.

(*See* also Report No. 1.)

Vernacular names.—Gulanda (Kanarese) ; Serrumgúnda Gulandélka (Waddars).

These are topotypes of Gray's species, later ; in his Dharwar List, Elliot named it *hirsutus*.

HYSTRIX LEUCURA, Sykes.

The Indian Porcupine.

(Synonymy in No. 1.)

76 (skull only). Dharwar.

(*See* also Report No. 1.)

Vernacular names.—Mulluhani, Yédu (Kanarese) ; Sáial, Sáyler (Marathi and Dekhani) ; Yetundi, Yédu (Waddars and Haran Shikaris).

[" Not plentiful round Dharwar."—G. C. S.]

LEPUS NIGRICOLLIS, Cuv.

The black-naped Hare.

1807. *Lepus hurgosa*, Buchanan. Voy. Mysore i., p. 169 (nomen nudum).

1823. *Lepus nigricollis*, F. Cuvier. Dict. Sc. Nat. XXVI, p. 307.

1843. *Lepus kurgosa*, Gray. Cat. Mamm. (nomen nudum).

1891. *Lepus nigricollis*, Blanford. Mammalia No. 319.

♀ 48. Alnawar, Dharwar.

♂ 75, 81 (imm.); 94. ; ♀ 74, 80. Dharwar.

♂ 123; ♀ 207. Devikop, Dharwar.

♂ 312, 313, 388; ♀ 457. Gadag, Dharwar.

♀ 647. Hawsbhavi, S. Dharwar.

♀ 730. Honkan, S. Dharwar.

♀ 790, 804 (in all.) Samasgi, S. Dharwar.

The type locality of this species is Malabar. It is also found in Java (introduced). The material is very scanty on which to judge, but the Nilgiri form seems to vary from this one and when specimens are available from Malabar for comparison both may be found to differ from true *nigricollis*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Vernacular names.—Mola, Mala (Kanarese); Sasá (Marathi); Kundéli (Waddars and Haran Shikaris); Khargosh (Dekhani).

["Occurring both in open and forest country. Chiefly, but not exclusively, nocturnal. Two young ones born in captivity, in early November, had their eyes open and were just able to move about within 12 hours. This hare is rather savage, and when caught will often attempt to bite, and to scratch with its fore paws, frequently uttering loud squeals. If two are confined together, one will generally fight with and kill the other."—G.C.S.]

Rusa unicolor, Bechs.

The Sambhar.

1799. *Cervus unicolor*, Bechstein. Allgeui. Uebers. Vierfus. i., p. 112.
1823. *Cervus hippelaphus*, Cuvier. Oss. Foss. ed. 2. N., p. 40.
1823. *Cervus equinus*, Cuvier. l. c., p. 45.
1825. *Cervus aristotelis*, Cuvier. Oss. Foss. ed. 3, iv., p. 503.
1825. *Cervus leschenaulti*, Cuvier. l. c., p. 506.
1831. *Cervus jarai*, Hodgson. Glean. Sc. iii., p. 321.
1843. *Axis pennantii*, Gray. List Mamm. B.M., p. 180.
1891. *Cervus unicolor*, Blanford. Mammalia No. 367.
♂ 295 (imm). Dharwar.

Vernacular names.—Kadave, Kadaba (Kanarese); Méru, Sámbar (Marathi); Sámbar (Dekhani).

Axis axis, Erxl.

The Spotted Deer.

1777. *Cervus axis*, Erxl. Syst. Reg. An., p. 312.
1831. *Cervus nudipalpebra*, Ogilby. P.Z.S., p. 136.
1841. *Axis major* and *minor*, Hodgson. S.A.S.B., x, p. 914.
1843. *Axis maculata*, Gray. List. Mam. B.M., p. 178.
1891. *Cervus axis*, Blanford. Mammalia No. 368.
802 ♀. Samasgi, S. Dharwar.

Vernacular names.—Sáraga, Sáranga (Kanarese and Waddars); Chital, Chithal, Mirg (all kinds of deer, Marathi and Dekhani); Kárdoh, Saringi (Haran Shikaris).

Antilope cervicapra, L.

The Black Buck.

1766. *Capra cervicapra*, Linnæus. Syst. Nat., p. 96.
1850. *Antilope bezoartica*, Gray. P.Z.S., p. 117.
1891. *Antilope cervicapra*, Blanford. Mammalia No. 357.
♂ 483. Hebli near Dharwar.
♂ 722, 724 (Skull only), 725; ♀ 706. Hawsbhavi, S. Dharwar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Vernacular names.—Chigari (Kanarese); Hàran, Krishnámrig (Marathi); Háran, Kalwít (Dekhani); Gínka (Waddars and Haran Shikaris).

["Not occurring in the immediate vicinity of Dharwar, but in the black cotton soil districts that stretch away to the north-east and south-east they are widely distributed and in many places sufficiently numerous to do a considerable amount of damage to the cotton crops. The does and immature bucks have a considerable resemblance to the Spring Buck of South Africa, and their habits are similar in many ways. But there is something stilted and stiff jointed about the movements of a Black Buck which is quite unlike a Spring Buck, which I consider the more graceful and certainly the swifter of the two."—G.C.S.]

GAZELLA BENNETTI.

The Indian Gazelle.

(For Synonymy, *see* Report No. 1.)

♂ (imm.) 1357. Near Haveri, Dharwar.

(*See* also Reports Nos. 1 and 3.)

Vernacular names.—Channachigari, Burari Kúngur (Kanarese); Chínkárá (Marathi and Dekhani).

TETRACEROS QUADRICORNIS, Blainv.

The four-horned Antelope.

(For Synonymy, *see* Report No. 2.)

♂ 800. Samasgi, S. Dharwar.

(*See* also Report No. 2.)

Vernacular names.—Kónd-kuri, Kan-kuri (Kanarese); Jángli-Békra (Marathi and Dekhani); these names are also used for *M. vaginalis* the Muntjac.

SUS CRISTATUS, Wagn.

The Indian Wild Boar.

1839. *Sus cristatus*, Wagner. Munch. Gel. Anz. ix., p. 435.
1843. *Sus indicus*, Gray. Cat. Mamm. (no description).
1847. *Sus affinis*, Gray. Cat. Ost. Spec, p. 71.
1860. *Sus indicus*, Blyth. J.A.S.B., xxix, p. 105.
1891. *Sus cristatus*, Blanford. Mammalia No. 374.

♀ 736, 375, Honkan, S. Dharwar.

Vernacular names.—Handi, Karimikka (Kanarese); Dúkar (Marathi); Fúndi (Waddars); Pandi (Haran Shikaris); Suar, Bura Jánwar (Dekhani).

Blanford points out, though he does not accept, Blyth's separation of three forms, under separate names, of the Indian Wild Pig. Blyth accepts the Malabar form as true *cristatus* and separates the trans Gangetic pig as *bengalensis* on account of the less marked constriction of the parietal and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the shorter tail. Blanford distinguishes *cristatus* from the European *scrofa* by the great size and complexity of its posterior molar. The material in the Museum is very scanty but in three adult or old Boars (from Malabar, Sind and 'India') I find that the parietal constriction measures from 28 to 34 mm., the posterior molar 43, and the next two together 35 mm., while in three animals (from Sikhim and the Tarai) these measurements average 46, 37 and 35 mm. respectively.

The question does not directly affect this report for the present specimens are undoubtedly *cristatus*, but I would suggest that the Society start a record of measurements of Indian Pigs. If a direct appeal were made to the Secretaries there should be no difficulty in obtaining body measurements from various Clubs, and the loan or gift of skulls for the desired measurements.

[The coloured plate of the Painted Bat *Kerivoula picta* which accompanies this paper gives a very good idea of the brilliant colouring of this bat.

The red of the wings is very faithfully reproduced but the fur on the head has hardly been made long enough which makes the ears appear to stand out more than they do in life. No one who has not seen this bat alive or a short time after death can have any idea of the beautiful colouring as it rapidly fades after death and in museum specimens the wings appear a parchment yellow.—EDS.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A LIST OF BIRDS FROM ARAKAN.

BY

CYRIL HOPWOOD, I.F.S.

Before attempting to deal with the birds met with during my two years' stay in Arakan, perhaps I may be permitted to give a brief description of the district itself, as I feel that this may prove of interest to those unacquainted with this corner of the Indian Empire, and help to explain the presence or absence of certain birds.

Arakan may be divided roughly into three belts. (i) The sea coast, (ii) the foot hills and (iii) the main hill ranges. With regard to (i) a considerable portion of the coast line is fringed with mangrove swamp, in which kingfishers, storks, herons and a few raptorial and passerine birds are found; but there are, in places, considerable areas of sandy beach, backed by open grassy downs, which are a favourite haunt of the small waders, and especially of the Eastern Golden Plover, which is found here in thousands. Between the sea coast and the foot hills lies the paddy land, which is of very considerable extent; this tract is of more interest to the sportsman than to the ornithologist, as there are few birds to be seen (other than the very commonest), except snipe and duck, though the latter are not too numerous, on account of the scarcity of suitable jheels.

Passing over (ii) for the moment, it may be stated roughly that practically the whole of (iii) is dense bamboo jungle, almost treeless, and consequently unsuitable for a great variety of bird life. The exception is the Kyaukpaudaung range, which reaches an elevation of about 4,000 feet. This range, which I was lucky enough to visit for a few days in May 1909, is a veritable ornithologist's paradise, and my only regret was that my time there was so limited. At a height of about 3,000 feet the bamboo gives place to very fine evergreen jungle, and at the top of the range there are numerous open grassy glades. As the birds met with here will be dealt with in their proper order, it is unnecessary to remark upon them at this point.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

From the foregoing, it follows that the bulk of the passerine birds are to be met with in the foot hills (ii) and the forest growth may be described as mainly of the deciduous type, fairly open, and without much undergrowth. The streams, however, many of which are perennial, are frequently fringed with dense evergreen jungle including palms and canes and the foot hills thus afford a very considerable variety of forest eminently suited to the requirements of passerine and raptorial birds. Further, as there is a good deal of paddy cultivation lying between the lower spurs, there is an additional attraction for such birds as find their food amongst the standing grain and stubbles. In conclusion, I must apologise for the meagreness of my list; and in extenuation would plead guilty to being an oologist rather than an ornithologist; this, added to the extreme difficulty of transporting specimens, accounts for my having undoubtedly passed over large numbers of the smaller passeres, especially warblers, though so far as possible, I made a point of shooting any small bird with which I was unacquainted.

The numbers used are from the "Fauna of British India."

ORDER PASSERES.

Family Corvidæ.

4. Corvus macrorhynchus.—The Jungle Crow.

Common on sea coast and in foot hills; frequently found feeding on garbage on the beach. I found two nests on 27th March 1909, each with three young, nearly fully fledged.

7. Corvus splendens.—The Indian House Crow.

The only house crow found at Akyab and to the north; to the south it extends as far as Kyaukpyu (some 60 miles south of Akyab), where it is found in company with *C. insolens*.

South of Kyaukpyu I failed to meet with it. It is of interest to note that it commences breeding at the end of February, and nests with eggs are numerous by the first week in March. It is much victimised by the Koel, of whom more anon. On 2nd March 1909, I obtained two very abnormal pale blue eggs, with a few large blotches, rather recalling the eggs of the talking Myna (*E. intermedia*), but quite rough to the touch, and glossless.

8. Corvus insolens.—The Burmese House Crow.

Found with *C. splendens* at Kyaukpyu, but not further north. South of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Kyaukpyu it replaces *C. splendens*. I did not look for nests, but doubtless it breeds in March.

12. Urocissa occipitalis.—The Red-billed Blue Magpie.

Foot hills of Arakan Yoma, but rare.

14. Cissa chinensis.—The Green Magpie.

I only met with the bird once myself, in March 1910, when beating for pig. The only other occasion on which I heard of it was from my friend Mr. Hamilton, of the Forest service, who tells me that when he was sitting up over a corpse for a man-eater, one of these birds came and pecked at the corpse; but whether it was devouring the flesh or searching for insects is uncertain. The incident, however, seems worthy of note. The bird would appear to be rare, as I did not meet with it at Kyaukpaudaung.

16. Dendrocitta rufa.—The Indian Tree-Pie.

Common, especially at Akyab, where it breeds in April and May, though I failed to find its nest.

31. Parus atriceps.—The Indian Grey Tit.

I think I saw some of these birds on Kyaukpaudaung, but failed to obtain a specimen. As its range extends throughout Burma it is fairly certain that it occurs in Arakan.

I met with no other birds which I even suspected of belonging to the *Parinæ* or *Paradoxornithinæ*. The country, on the whole, is unsuitable for these birds, and if any occur they must be very rare and local.

Family Crateropodidæ.

69. Garrulax leucolophus.—The Himalayan White-Crested Laughing Thrush.

Fairly common. I got a nest with 4 eggs on 8th May 1909 on Kyaukpaudaung. I failed to meet with *G. belangeri* at all.

72. Garrulax pectoralis.—Black-gorgeted Laughing Thrush.

Common. I saw a partial albino of this species, but failed to secure it.

73. Garrulax moniliger.—The Necklaced Laughing Thrush.

Less common than the preceding.

116. Pomatorhinus schisticeps.—The Slaty-headed Scimitar Babbler.

Fairly common, and one of the few birds which inhabits the heavy bamboo jungle.

131. Pomatorhinus hypoleucus.—The Arakan Scimitar Babbler.

Not common, and appears to inhabit the dense bamboo forest. I was fortunate enough to obtain a nest with 2 eggs on 26th January 1909. The nest was of the usual type, and placed in a fork of a bamboo. It was made of the twigs and tendrils of a creeper, and thickly lined with roots and fibres of fern. It measured 13 inches from top of dome to base and 7 inches from entrance, which was at the side to back.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

134. TIMELIA PILEATA.—The Red-capped Babbler.

Far from common, but occurs occasionally in scrub jungle, usually near the sea.

137. GAMPSORHYNCHUS RUFULUS.—The White-headed Shrike-Babbler.

I only once met with these birds, and that was in dense bamboo jungle at the foot of the Sandway Yoma. I secured one immature specimen.

139. PYCTORHIS SINENSIS.—The Yellow-eyed Babbler.

Not uncommon in scrub jungle near the sea coast; resident and breeds.

143. PELLORNEUM MINUS.—Sharpe's Spotted Babbler.

Mr. Oates was good enough to identify my specimen, whose nest I found on Kyaukpaudaung on May 10th, 1909, with 3 eggs. The bird is not uncommon; all the specimens I obtained were similar to that sent to Mr. Oates, so I fancy that *P. subochraceum* does not occur in Arakan.

153. CORYTHOCICHLA STRIATA.—The Streaked Babbler.

I record this with some diffidence, as the bird was severely damaged by the shot, and could not be preserved; but it appeared, after careful examination, to be referable to this species. It was one of a pair, which appeared to be breeding, though I could not find the nest, and was obtained on Kyaukpaudaung on May 9th, 1909.

160. TURDINUS ABBOTTI.—Abbot's Babbler.

Not uncommon in evergreen jungle.

163. ALCIPPE NEPALENSIS.—Nepal Babbler.

On Kyaukpaudaung, where I found a nest on May 10th, 1909. I failed to meet with the bird elsewhere, or with *A. phayrii*.

169. STACHYRHIS NIGRICEPS.—The Black-throated Babbler.

Not uncommon. Nest with 4 eggs on Kyaukpaudaung on 8th May 1909.

188. MYIOPHONEUS EUGENII.—The Burmese Whistling Thrush.

Not common.

Other members of the *Brachypteryginæ* and of the *Sibiinæ* are likely to occur on Kyaukpaudaung, but I should not expect to find them elsewhere.

243. ÆGITHINA TIPHIA.—The Common Iora.

Common everywhere.

247. CHLOROPSIS AURIFRONS.—The Gold-fronted Chloropsis.

Fairly common.

250. CHLOROPSIS CHLOROCEPHALA.—The Burmese Chloropsis.

Common.

254. IRENA PUELLA.—The Fairy Blue Bird.

Rather rare; but breeds, as I shot a female on April 8th, 1909, which would have laid in a few days time.

255. MELANOCHLORA SULTANEA.—The Sultan Bird.

A single specimen, probably breeding, on Kyaukpaudaung, May 1909.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SUB-FAMILY BRACHYPODINÆ.

263. CRINIGER FLAVEOLUS.—The White-throated Bulbul.

I believe this to be the common Criniger of Arakan. I have undoubted specimens of this bird, but none of *C. burmanicus*. The birds are common, but difficult to shoot.

269. HYPSIPETES PSAROIDES.—Himalayan Black Bulbul.

Very common on Kyaukpaudaung, where I got numerous nests in May 1909; but I did not see it elsewhere. I failed to meet with *H. concolor*.

272. HEMIXUS FLAVALA.—The Brown-eared Bulbul.

Kyaukpaudaung, but not elsewhere.

275. HEMIXUS MACCLELLANDI.—Rufous-bellied Bulbul.

Kyaukpaudaung, not elsewhere.

279. MOLPASTES BURMANICUS.—Burmese Red-vented Bulbul.

Common everywhere.

287. XANTHIXUS FLAVESCENS.—Blyth's Bulbul.

Mr. Oates identified two specimens from Kyaukpaudaung, where they are common. They are smaller than the type specimens, but this Mr. Oates attributes to their being young birds. However, I shot adults which were no larger, and I am inclined to think that this is a small local race; there is no reason to consider it a different species.

288. OTOCAMPSA EMERIA.—Bengal Red-whiskered Bulbul.

Common everywhere.

290. OTOCAMPSA FLAVIVENTRIS.—Black-crested yellow Bulbul.

Common. I saw a pair collecting nesting materials in March 1910; but I have never found a nest.

306. PYCNONOTUS BLANFORDI.—Blanford's Bulbul.

Very rare in Arakan, the country being unsuited to its habits; but occurs occasionally.

310. MICROPUS MELANOCEPHALUS.—The Black-headed Bulbul.

I obtained a single specimen on 2nd March 1909, near the Akyab race-course. I searched for a nest, but was not successful.

FAMILY SITTIDÆ.

325. SITTA FRONTALIS.—Velvet-fronted Blue Nuthatch.

This bird is very fairly common, and appears to be the only nuthatch commonly found in Arakan. *S. neglecta* was not met with.

FAMILY DICRURIDÆ.

327. DICRURUS ATER.—The Black Drongo.

Common.

333. DICRURUS CINERACEUS.—The Grey Drongo.

I saw, but failed to secure a species of Grey Drongo on several occasions. I feel almost certain that these birds were *D. cineraceus*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

335. CHIBIA HOTTENTOTTA.—The Hair-crested Drongo.

Common everywhere. I have seen flocks of 40 or 50 together. On one occasion they were dashing into the water from an overhanging tree, flying back, and repeating the performance; they seemed to be bathing or playing, not feeding.

339. BHRINGA REMIFER.—Lesser Racket-tailed Drongo.

Fairly common.

340. DISSEMURUS PARADISEUS.—Larger Racket-tailed Drongo.

Common throughout the foot hills, and along the larger streams. I found several nests, but was unable to get at them. Curiously enough I obtained two nests quite easily accessible, in mango trees, near Rangoon shortly after I left Arakan. The tail feathers of this bird, and of *B. remifer*, are much sought after for use as head-dresses by the Chin hill-tribes.

FAMILY CERTHIIDÆ.

I failed to identify any species, but once or twice I saw a wren, probably a species of *Pnoepyga*.

FAMILY SYLVIIDÆ.

As already stated, I know that I missed many warblers; the appended list is therefore very meagre, and far from representative.

363. ACROCEPHALUS STENTOREUS.—Indian Great Reed Warbler. Obtained a single specimen on 28th March 1910.

367. ACROCEPHALUS AGRICOLA.—Paddy-field Reed Warbler.

I got a bird on 9th February 1909, which I identified as this species, but unfortunately the bird went bad before I had time to skin it, so I was unable to have my opinion corroborated.

374. ORTHOTOMUS SUTORIUS.—Tailor-bird.

Very common. Nests abundantly in May.

379. CISTICOLA TYTLERI.—Yellow-headed Fantail Warbler.

Identified for me by Mr. Oates. Cisticolas are very common in suitable localities, but I failed to actually identify any other species. I found no nests.

382. FRANKLINIA GRACILIS.—Franklin's Wren-Warbler.

Appears common. Numerous nests were obtained by my friend, Mr. Thorn, near Paletwa in N. Arakan.

424. ACANTHOPNEUSTE MAGNIROSTRIS.—Large-billed Willow-Warbler.

I record this species with some diffidence, as the single specimen obtained was moulting, and was damaged by the shot. But it was without doubt an *Acanthopneuste;* and judging by the dark colour, attributable to this species. Date 12th April 1910.

463. PRINIA FLAVIVENTRIS.—Yellow-bellied Wren-Warbler.

Common and breeds.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

468. PRINIA BLANFORDI.—Burmese Wren-Warbler.

I cannot swear to the species, but it is either this or *P. inornata*. Not common.

FAMILY LANIIDÆ.

474. LANIUS COLLURIOIDES.—The Burmese Shrike.

Common in the winter. Leaves about April, and first seen on return on October 3rd, 1909.

481. LANIUS CRISTATUS.—Brown Shrike.

Very common near the sea coast from August to April. Mr. Oates identified the bird for me, but it was not quite typical. I much regret not having collected a series, though I see no reason for suspecting the occurrence of a new species. But it is just possible.

484. HEMIPUS PICATUS.—Black-backed Pied Shrike.

I several times saw birds which I presume belonged to this species, and shot and identified one on 20th March 1910.

488. TEPHRODORNIS PONDICERIANUS.—Common Wood Shrike.

Common in suitable localities. I failed to obtain any other species of *Tephrodornis*.

491. PERICROCOTUS FRATERCULUS.—Burmese Scarlet Minivet.

I did not actually obtain a specimen, as the birds were very rare, but I presume the few seen were of this species.

500. PERICROCOTUS PEREGRINUS.—Small Minivet.

Common. Breed in the Casuarina trees in Akyab cantonments.

510. GRAUCULUS MACII.—Large Cuckoo Shrike.

Very common and noisy. I was lucky enough to get a nest, with two nearly fresh eggs on 30th March 1909, to which I was attracted by the agitation of the birds. It was only when my man climbed the tree that the nest was discovered, as it was almost invisible from below, being most cunningly concealed in a forked branch.

512. ARTAMUS FUSCUS.—Ashy Swallow Shrike.

Very common. Breeds about April in the Casuarinas in Akyab.

FAMILY ORIOLIDÆ.

521. ORIOLUS MELANOCEPHALUS.—Indian Black-headed Oriole.

Common everywhere.

FAMILY EULABETIDÆ.

524. EULABES INTERMEDIA.—Indian Grackle.

Not very common. Obtained eggs in N. Arakan in May. As elsewhere, a favourite cage bird. One of a pair which I had in my aviary was a brilliant talker and mimic, and could also whistle tunes.

FAMILY STURNIDÆ.

538. STURNIA MALABARICA.—The Grey-headed Myna.

Common. Breeds in holes in the Casuarinas in April and May in Akyab.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

549. ACRIDOTHERES TRISTIS.—Common House Myna.

Common everywhere.

552. ŒTHIOPSAR FUSCUS.—The Jungle Myna.

Common in all suitable localities, but I failed to find a nest.

556. STURNOPASTOR SUPERCILIARIS.—Burmese Pied Myna.

Very common and breeds in large numbers near towns and villages in May. Mr. Oates writes under *S. contra*: "A specimen from Arakan in the British Museum is a typical *S. contra.*" Every single bird which I met with, and I shot some dozens, and examined many more through glasses at close range were typical *S. superciliaris.* The British Museum specimen must, therefore, have been a rare straggler.

FAMILY MUSCICAPIDÆ.

Flycatchers are scarcely as numerous as might be expected, and I failed to meet with several usually common species. I am inclined to think that I did not overlook many, as I take a rather particular interest in this family.

558. HEMICHELIDON SIBIRICA.—Sooty Fly-catcher.

Apparently confined to Kyaukpaudaung, where I obtained a specimen on May 7th, 1909. From the date, I should judge it to be resident.

562. SIPHIA ALBICILLA.—Eastern Red-breasted Fly-catcher.

Common winter migrant approximately from November to March. All in female dress.

569. CYORNIS MELANOLEUCUS.—Little Pied Fly-catcher.

Common in Kyaukpaudaung at about 4,000 feet, not seen elsewhere.

575. CYORNIS RUBECULOIDES.—Blue-throated Fly-catcher.

Appears common.

592. CULICICAPA CEYLONENSIS.—Grey-headed Fly-catcher.

Common.

594. NILTAVA SUNDARA.—Rufous-bellied Niltava.

Though several times seen, I failed to shoot a specimen; but I am well acquainted with the bird which I obtained in the Upper Chindwin, not a great distance from Arakan as the crow (or Niltava!) flies, so I think it may safely be recorded.

599. TERPSIPHONE AFFINIS.—Burmese Paradise Fly-catcher.

Fairly common in suitable localities. I got a nest from an evergreen stream with two fresh eggs on 13th April 1909. The nest was placed in the angle between the stem and leaf of a wild canna. Cock bird in chestnut plumage.

605. RHIPIDURA ALBICOLLIS.—White-throated Fantail Fly-cather.

Not common. One of the birds which haunts the gloomy bamboo forests of the Yoma, where I first observed it.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FAMILY TURDIDÆ.

608. PRATINCOLA CAPRATA.—Common Pied Bush Chat.

Common and breeds.

610. PRATINCOLA MAURA.—Indian Bush Chat.

Common winter migrant.

631. HENICURUS GUTTATUS.—Eastern Spotted Forktail.

On Kyaukpaudaung only. I obtained a nest of the usual Forktail type with three fresh eggs on May 8th, 1909. The nest was in a cleft of a rock over water.

633. HENICURUS IMMACULATUS.

Common along all jungle streams, and occasionally seen in Akyab cantonments. Breeds March and April.

638. CHIMARRHORNIS LEUCOCEPHALUS.—White-capped Redstart.

Not common, but occasionally met with near waterfalls in perennial streams. Probably breeds, as I have seen it as late as April.

646. RHYACORNIS FULIGINOSUS.—Plumbeous Redstart.

A single female. N. Arakan. Cold weather.

663. COPSYCHUS SAULARIS.—Magpie-Robin.

Common.

664. CITTOCINCLA MACRURA.—Shama.

Not common.

686. GEOCICHLA CITRINA.—Orange-headed Ground Thrush.

Only met with on Kyaukpaudaung, in evergreen jungle at about 4,000 feet. I got three nests on May 8th and 9th, 1909, containing respectively 1 fresh, 3 slightly incubated and 2 hard set eggs. The nests were of the usual type, placed in the fork of a sapling in each case.

693. PETROPHILA CYANUS.—Western Blue Rock Thrush.

Common from October to about April. A few arrive in September. This bird occasionally sings most beautifully but very rarely.

698. OREOCINCLA DAUMA.—Small-billed Mountain Thrush.

Ruchaung, N. Arakan, March 1910. Appears rare.

FAMILY PLOCEIDÆ.

720. PLOCEUS BAYA.—The Baya.

Common.

723. PLOCEUS MANYAR.—Striated Weaver-bird.

Common.

725*a*. MUNIA ORYZIVORA.—The Java Sparrow.

I met with a flock of six on September 26th, 1909, when snipe shooting: they were feeding on grass seeds, like common munias. Again, in March 1910 I saw a pair in Akyab cantonments and a single specimen in the paddy fields in April 1910. The birds are known to the Arakanese villagers, so the species may be taken as thoroughly established in Arakan.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

726. MUNIA ATRICAPILLA.—Chestnut-bellied Munia.

Common.

727. UROLONCHA ACUTICAUDA.—Hodgson's Munia.

Common. Breeds early in May, when I obtained several nests with fresh eggs.

735. UROLONCHA PUNCTULATA.—Spotted Munia.

Common everywhere.

739. SPORÆGINTHUS FLAVIDIVENTRIS.—Burmese Red Munia.

Fairly common. Found a nest of young birds at the end of August 1909 in a screw-pine on a bund in a paddy field.

FAMILY FRINGILLIDÆ.

761. CARPODACUS ERYTHRINUS.—Common Rose Finch.

A single specimen at Myohaung, 3rd March 1910. I am told the bird is not uncommon in this particular locality. It is one of the few places in the "plains" of Arakan, or rather of the Akyab district of Arakan, where there is a fair extent of jungle, other than mangrove jungle, and is consequently a good place for birds. The woodland near Myohaung would repay more careful exploration than I was able to give.

776. PASSER DOMESTICUS.—The House Sparrow.

It may be of interest to record that this bird is not found north of Kaladan on the Kaladan river. It does not occur at the little town of Paletwa, the head-quarters of N. Arakan; nor is it replaced by any other sparrow. At Akyab, I found a nest containing young sparrows built into a kite's nest, in which were young kites and the sparrows were quite unmolested. The sparrows also use old kingfisher's burrows, which are very numerous near Akyab, as nesting sites.

780. PASSER CINNAMOMEUS.—Cinnamon Tree Sparrow.

Rare.

I only identified one bunting, though I saw others.

797. EMBERIZA AUREOLA.—Yellow-breasted Bunting.

Occurs in large flocks, and is common in the cold weather months. I observed them as late as April.

FAMILY HIRUNDINIDÆ.

807. CHELIDON NEPALENSIS.—Hodgson's Martin.

Common at Kyaukpaudaung, where it breeds on the cliffs in April and May. The nests, as a rule, are inaccessible and I did not get eggs. The birds are occasionally met with, but are rare elsewhere.

809. COTILE SINENSIS.—Indian Sand Martin.

Common.

814. HIRUNDO GUTTURALIS.—Eastern Swallow.

Common everywhere in winter.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

815. HIRUNDO TYTLERI.—Tytler's Swallow.

Fairly common.

817. HIRUNDO JAVANICA.—Nilgiri House Swallow.

I failed to satisfy myself as to whether these birds are resident throughout the year, but I obtained eggs from some cliffs by the sea at Kyaukpgu at the end of March, and the birds are common in winter. Oates does not record this bird from Burma.

818. HIRUNDO SMITHII.—Wire-tailed Swallow.

Common. Nest with 4 eggs from a cliff on the Lemru river, N. Arakan April 12, 1909.

822. HIRUNDO NEPALENSIS.—Hodgson's Striated Swallow.

Appears to occur only in N. Arakan, where I met with it in April and May fairly commonly.

FAMILY MOTACILLIDÆ.

Wagtails are very numerous in Arakan. The following were actually identified, but there are probably others.

826. MOTACILLA ALBA.—White Wagtail.

Common everywhere.

828. MOTACILLA OCULARIS.—Streak-eyed Wagtail.

Upper Kaladan, N. Arakan, November 1908.

832. MOTACILLA MELANOPE.—Gray Wagtail.

Common in winter; earliest date of appearance September 20, 1909.

834. MOTACILLA FLAVA.—Blue-headed Wagtail.

Not uncommon.

839. LIMONIDROMUS INDICUS.—Forest Wagtail.

Twice seen in January and February 1909 but I failed to secure either specimen. I have shot it elsewhere in Burma, and once identified. It is easily recognised, so may be unhesitatingly recorded.

845. ANTHUS RICHARDI.—Richard's Pipit.

Common.

847. ANTHUS RUFULUS.—Indian Pipit.

Common everywhere, and I saw a pair carrying nesting materials in February; but as I was on the march, I did not look for the nest.

850. ANTHUS ROSACEUS.—Hodgson's Pipit.

A young bird, Akyab racecourse, 24th November 1908. Just assuming the pinkish tinge on head and neck; breast and sides heavily streaked. The specimen, which I had intended to preserve, was unfortunately stolen from my verandah by a crow!

FAMILY ALAUDIDÆ.

861. ALAUDA GULGULA.—Indian Sky-Lark.

Resident and breeds from March to May, in both of which months I got nests.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

870. MIRAFRA ASSAMICA.—Bengal Bush Lark.

Very common and resident.

FAMILY NECTARINIIDÆ.

The birds of this family are very plentiful in Arakan, but I only identified a few.

884. ÆTHOPYGA CARA.—Tenasserim Yellow-backed Sun-bird.

Oates says that it is "doubtful if this sun-bird extends to Arakan or not." I can now positively state that it is common in Arakan, being found usually on the edge of the forest, near the paddy fields.

895. ARACHNECTHRA ASIATICA.—Purple Sun-bird.

Common.

896. ARACHNECTHRA HASSELTI.—Van Hasselt's Sun-bird.

This beautiful Sun-bird is not uncommon.

898. ARACHNECTHRA FLAMMAXILLARIS.—Burmese Yellow-breasted Sun-bird.

Common.

903. ANTHOTHREPTES MALACCENSIS.—Brown-throated Sun-bird.

Fairly common.

909. ARACHNOTHERA LONGIROSTRIS.—Little Spider-Hunter.

Fairly common, but I never succeeded in finding a nest, though I think I must have been near one more than once, to judge from the excitement of the birds.

FAMILY DICÆIDÆ.

912. DICÆUM CRUENTATUM.—Scarlet-backed Flower Pecker.

Common.

914. DICÆUM CHRYSORRHŒUM.—Yellow-vented Flower Pecker.

Rather rare.

919. DICÆUM ERYTHRORHYNCHUS.—Tickell's Flower Pecker.

Not uncommon. A bold familiar little bird, which will settle close to one, and is far too intent on its own business to take much notice of one's movements.

I also saw, once or twice, a bird which I should be inclined to attribute to the genus *Prionochilus*; but as I did not obtain a specimen I cannot venture any more definite opinion.

FAMILY PITTIDÆ.

927. PITTA NEPALENSIS.—Blue-naped Pitta.

Not common. The jungle is not suitable for Pittas, but *P. cyanea* and *P. cyanoptera* are also recorded from Arakan, and would probably be found on Kyaukpaudaung.

This concludes the Passeres, of which I find I have actually identified 121 species. There is therefore plenty of scope for further research!

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ORDER EURYLÆMI.

Family Eurylæmidæ.

I only met with two species, both on Kyankpaudaung. These were :—

943. Serilophus rubripygius.—Gould's Broadbill.

944. Psarisomus dalhousiæ.—Long-tailed Broadbill.

I got nests of both, May 7th to 9th, but whereas I only got one of *P. dalhousiæ*, I got about half a dozen of *S. rubripygius*, and frequently saw the birds.

ORDER PICI.

Family Picidæ.

In my nine years' experience of Burma, during which I have served in some ten "districts," I have never struck a place in which the *Pici* are so scarce as in Arakan. This is doubtless accounted for by the immense areas of bamboo jungle, and the paucity of tree growth; but even in ordinary tree jungle, woodpeckers are far less numerous than usual. I wonder if the proximity of the sea, and the heavy rainfall has anything to do with this. The following list is complete as far as my observations went, as I did not see a single woodpecker which I failed to identify.

951. Gecinus chlorolophus.—Small Himalayan Yellow-naped Woodpecker.

Common.

958. Gecinulus grantia.—Northern Pale-headed Woodpecker.

Fairly common in the bamboo jungle.

967. Dendrocopus macii.—Fulvous-breasted Pied Woodpecker.

Common; nest in Akyab in a bamboo which had been used as a post in a deserted hut, June 1909, with three young.

988. Tiga javanensis.—Common Golden-backed Three-toed Woodpecker.

Very common.

992. Chrysocolaptes guttacristatus.—Tickell's Golden-backed Woodpecker.

Common.

995. Hemicercus canente.—Heart-spotted Woodpecker.

Fairly common.

996. Hemilophus pulverulentus.—Great Slaty Woodpecker.

I only saw one pair, and found the nest hole on May 10th, 1910, but it proved inaccessible to my great disappointment. It was in a huge "Kauyin" (wood-oil) tree, fully eighty feet from the ground.

1002. Sasia ochracea.—Rufous Piculet.

Common.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ORDER ZYGODACTYLI.

FAMILY CAPITONIDÆ.

1009. THEREICERYX LINEATUS.—Lineated Barbet.

Common.

1012. CYANOPS ASIATICA.—Blue-throated Barbet.

Common. I got a nest with two fresh eggs on the road to Kyaukpandaung at about 3,000 feet, May 7th, 1909.

1019. XANTHOLÆMA HÆMATOCEPHALA.—"Coppersmith."

Very common.

ORDER ANISODACTYLI.

FAMILY CORACIADÆ.

1023. CORACIAS AFFINIS.—Burmese Roller.

Very common.

1025. EURYSTOMUS ORIENTALIS.—Broad-billed Roller.

Fairly common.

FAMILY MEROPIDÆ.

1026. MEROPS VIRIDIS.—Common Indian Bee-eater.

1027. MEROPS PHILIPPINUS.—Blue-tailed Bee-eater.

Appears to be more or less migratory, as I noticed both in 1909 and 1910 that it was far more abundant in the breeding season, April and May, than at other times.

1030. MELITTOPHAGUS SWINHOII.—Chestnut headed Bee-eater.

Common.

1031. NYCTIORNIS ATHERTONI.—Blue-bearded Bee-eater.

Not uncommon. I found a nest early in May, 1910, but without eggs.

FAMILY ALCEDINIDÆ.

1033. CERYLE VARIA.—Indian Pied Kingfisher.

Very common. I found young birds just able to fly on March 21st, 1909; and got a nest with 5 eggs on April 13th, 1910.

1034. CERYLE LUGUBRIS.—Himalayan Pied Kingfisher.

N. Arakan, Lemin river only, but common there.

1035. ALCEDO ISPIDA.—Common Kingfisher. Common.

1041. PELARGOPSIS AMAUROPTERA.—Brown-winged Kingfisher.

Common near the sea coast, and in mangrove swamps. This bird has the habit of plunging into the surf, and settling on the sand while it secures its prey, allowing the waves to break over it.

1043. PELARGOPSIS GURIAL.—Brown-headed Stork-billed Kingfisher.

Common, but keeps most to the fresh water, rarely coming down to tidal limits. *P. amauroptera*, on the contrary, I never found frequenting fresh water.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1044. HALCYON SMYRNENSIS.—White-breasted Kingfisher.

Very common.

1045. HALCYON PILEATA.—Black-capped Kingfisher.

Very common in fidal jungle, and along brackish creeks. Common as it was, I totally failed to find a nest.

1047. SAUROPATIS CHLORIS.—White-collared Kingfisher.

Common in same habitat as *H. pileata*, and very noisy. This bird undoubtedly breeds in holes of dead trees, and apparently excavates its own burrow. I found several such holes, but failed to obtain eggs. My friend Mr. Wickham, however, got them from trees in the Andamans, and I have a clutch which he gave me. One of my clerks told me that there was a nest of this species in a tree in his compound at Akyab a few years ago. The bird is commonly seen in the gardens in Akyab town, and I have no reason to disbelieve his statement.

FAMILY BUCEROTIDÆ.

1051. DICHOCEROS BICORNIS.—Great Hornbill.

Common.

1053. ANTHRACOCEROS ALBIROSTRIS.—Indo-Burmese Pied Hornbill.

Common. I had two of these birds as pets, and they were extremely tame, flying about loose in the compound, and coming into the house when they wanted food. As an amusing pet, this bird is hard to beat; but it is a tyrant in an aviary, and will kill small birds.

1054. RHYTIDOCEROS UNDULATUS.—Malayan Wreathed Hornbill.

Not common, confined to the hills, and very shy and wary. I did not succeed in collecting a specimen, but identified them with the aid of field glasses.

FAMILY UPUPIDÆ.

1067. UPUPA INDICA.—Indian Hoopoe.

Common. I once took a single young bird from a nest (the others had, I suppose, flown), and put it in a cage in my verandah, fully 300 yards from its nest. Within a few hours the old birds were feeding it, and continued to do so for two days, when it made its escape.

ORDER MACROCHIRES.

FAMILY CYPSELIDÆ.

1074. CYPSELUS SUBFERCATUS.—Malayan House Swift.

Breeds in hundreds on Kyaukpandaung in May, but the nests were inaccessible.

1076. TACHORNIS INFUMATUS.—Eastern Palm Swift.

Common.

1078. CHÆTURA INDICA.—Brown-necked Spine-tail.

Common.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FAMILY CAPRIMULGIDÆ.

1091. CAPRIMULGUS ASIATICUS.—Common Indian Nightjar.
Common.

1093. CAPRIMULGUS MACRURUS.—Horsfield's Nightjar.
Common.

1096. LYNCORNIS CERVINICEPS.—Great Eared Nightjar.
Fairly common.

ORDER TROGONES.

FAMILY TROGONIDÆ.

1101. HARPACTES ERYTHROCEPHALUS.—Red-headed Trogon.
Common.

1103. HARPACTES ORESCIUS.—Yellow-breasted Trogon.
I made the acquaintance of this beautiful Trogon for the first time in Arakan. It is not common.

ORDER COCCYGES.

FAMILY CUCULIDÆ.

1104. CUCULUS CANORUS.—The Cuckoo.
Two in September, 1908. Presumably migrating.

1107. CUCULUS MICROPTERUS.—Indian Cuckoo.
Fairly common.

1108. HIEROCOCCYX SPARVERIOIDES.—Large Hawk-Cuckoo.
Not common.

1113. CACCOMANTIS MERULINUS.—Rufous-bellied Cuckoo.
Not common.

1114. PENTHOCERYX SONNERATI.—Banded Bay Cuckoo.
Rare.

1119. COCCYSTES COROMANDUS.—Red-winged Crested Cuckoo.
Met with occasionally but not commonly. I also have it in my mind that I saw *C. jacobinus*, and failed to note it in my book, so it must be considered a "doubtful starter."

1120. EUDYNAMIS HONORATA.—Indian Koel.
For a koël-ridden place, commend me to Akyab. There are more koëls to the square yard, I should imagine, than in any other portion of the Indian Empire. I am inclined to agree that the bird is partially migratory, as it is far more common in the breeding season than at other times. As stated above *C. splendens* breeds in Arakan in March, and the koël of course, follows suit. During the first week in March 1909, I got koël's eggs *ad. lib.* and I believe I established a record, on March 4, when I took seven koël's eggs from one crow's nest (and incidentally performed a public service). There were no crow's eggs in this nest, and the koël's

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

eggs were all fresh. The eggs were of three distinct types, and made three natural clutches of 3, 2, and 2. I presume three koëls were laying in this nest, and the crows had given it up as a bad job. I saw crows feeding young koëls as late as July.

1123. RHOPODYTES TRISTIS.—Large Green-billed Malkoha.

Fairly common.

1130. CENTROPUS SINENSIS.—Common Corocal.

Common.

ORDER PSITTACI.

FAMILY PSITTACIDÆ.

1136. PALÆORNIS INDOBURMANICUS.—Large Burmese Paroquet.

Common.

1138. PALÆORNIS TORQUATUS.—Rose-ringed Paroquet.

Common.

1145. PALÆORNIS FASCIATUS.—Red-breasted Paroquet.

By far the commonest parrot in Arakan.

1150. LORICULUS VERNALIS.—Indian Loriquet.

Common.

P. schisticeps or *finschi* probably occurs, but I failed to meet with either.

ORDER STRIGES.

FAMILY ASIONIDÆ.

1164. KETUPA ZEYLONENSIS.—Brown Fish Owl.

Common, and breeds in Akyab.

1178. SCOPS BAKKAMŒNA.—Collared Scops Owl.

Common. I found two nests with young in April 1909 and 1910.

1180. ATHENE BRAMA.—Spotted Owlet.

Common.

1187. NINOX SCUTULATA.—Brown Hawk Owl.

I know the call of this owl well, having shot them, whilst shooting, in the Chindwin. I did not actually see a specimen in Arakan, but frequently heard them calling, so include it in my list.

ORDER ACCIPITRES.

FAMILY PANDIONIDÆ.

1189. PANDION HALIAETUS.—The Osprey.

A not uncommon winter visitor, usually met with near the sea.

FAMILY VULTURIDÆ.

1191. OTOGYPS CALVUS.—Black Vulture.

Rather rare.

1195. GYPS TENUIROSTRIS.—Himalayan Long-billed Vulture.

Common.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1196. PSEUDOGYPS BENGALENSIS.—Indian White-backed Vulture.

Very common.

FAMILY FALCONIDÆ.

1212. SPIZAËTUS LIMNAËTUS.—Changeable Hawk Eagle.

Not common: but I was lucky enough to get a nest, with a single hard set egg, on April 22nd, 1910.

1217. SPILORNIS CHEELA.—Crested Serpent Eagle.

The commonest eagle in Arakan, found everywhere.

1223. HALIAËTUS LEUCORYPHUS.—Pallas' Fishing Eagle.

Fairly common. Found a nest without eggs on 9th November 1909.

1224. HALIAËTUS LEUCOGASTER.—White-bellied Sea Eagle.

Very common near the sea. I found several nests in October and November, but always failed to get eggs.

1226. POLIOAËTUS ICHTHYAËTUS.—Large Gray-headed Fishing Eagle.

Fairly common. Nest with almost fledged chick on January 26th, 1910.

1228. HALISTUR INDUS.—Brahminy Kite.

Very common.

1229. MILVUS GOVINDA.—Common Pariah Kite.

Very common.

1232. ELANUS CÆRULEUS.—Black-winged Kite.

Rare.

1233. CIRCUS MACRURUS.—Pale Harrier.

Very common in winter.

1236. CIRCUS MELANOLEUCUS.—Pied Harrier.

Common in winter.

1237. CIRCUS ÆRUGINOSUS.—Marsh Harrier.

Common in winter.

1244. ASTUR BADIUS.—The Shikra.

Common.

1254. FALCO PEREGRINUS.—Peregrine Falcon.

Not common.

1265. TINUNCULUS ALAUDARIUS.—Kestrel.

Common, especially in the hot weather. I noticed large numbers of Kestrels on Akyab race course, in March and April; on shooting a specimen, I found that it had been feeding almost entirely on a kind of large cricket, which is very abundant at this time of year; and which doubtless attracts the hawks.

ORDER COLUMBÆ.

FAMILY COLUMBIDÆ.

1271. CROCOPUS PHŒNICOPTERUS.—Bengal Green Pigeon.

Rare.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1273. OSMOTRERON PHAYREI.—Ashy-headed Green Pigeon.

Very common.

1278. OSMOTRERON BICINCTA.—Orange-breasted Green Pigeon.

Fairly common. On March 13, 1909, I got a nest with two slightly incubated eggs. The nest was placed in a pollarded stump, only a few feet from the ground, and the eggs were plainly visible when the bird flew away.

1281. TRERON NEPALENSIS.—Thick-billed Green Pigeon.

Not common.

1284. CARPOPHAGA ÆNEA.—Green Imperial Pigeon.

Common, and breeds from February to May, as I have found nests in both months.

1289. MYRISTICIVORA BICOLOR.—Pied Imperial Pigeon.

This I believe to be the first record from Burma, at all events from the mainland. One of my men shot three from a flock of four in February 1910, a little south of Sandoway; one of the skins was sent to the Bombay Natural History Society. The villagers at once recognised the birds, and say they are numerous, and breed, in the islands off the coast, visiting the mainland in the winter months. The crops of the birds shot were stuffed with wild figs; and the birds were far superior to *C. ænea* for the table.

1291. CHALCOPHAPS INDICA.—Bronze-winged Dove.

Common.

1304. TURTUR ORIENTALIS.—Rufous Turtle Dove.

Common.

1308. TURTUR TIGRINUS.—Malay Spotted Dove.

Very common.

1311. ŒNOPOPELIA TRANQUEBARICA.—Red Turtle Dove.

Fairly common.

ORDER GALLINÆ.

FAMILY PHASIANIDÆ.

1325. PAVO MUTICUS.—Burmese Peafowl.

Occurs sparingly in the Sandoway District.

1327. POLYPLECTRUM CHINQUIS.—Gray Peacock-Pheasant.

Not uncommon in the N. Arakan Hill tracts.

1328. GALLUS FERRUGINEUS.—Red Jungle Fowl.

Common.

1340*d*. GENNÆUS CUIVIERI.

Silver Pheasants are not common as a rule, as the Jungle is unsuitable. But in N. Arakan they are fairly plentiful throughout and along the Ru stream, a feeder of the Lemru, they positively swarm. The specimens collected by me, and sent to the late Mr. Oates, were identified by him

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as *G. prendergarsti*. However, on comparison with the types in the British Museum, my specimens were found to be identical with *G. cuivieri* and were identified and labelled by Mr. Ogilvie Grant as such. I only met with the one variety, but one male approximates to typical *G. horsfieldi*. This came from the Chittagong border.

1354. EXCALFACTORIA CHINENSIS.—Blue-breasted Quail.

Fairly common on swampy grazing grounds. This bird seems to have a very strong scent, as my spaniel used always to get very keen when they were about.

1364. ARBORICOLA INTERMEDIA.—Arakan Hill Partridge.

Common almost everywhere in the jungle, and easily detected once its call is known. Breeds in March, when I obtained eggs.

1365. ARBORICOLA ATRIGULARIS.—White-cheeked Hill Partridge.

Rare. I only obtained one specimen, at about 2,000 feet, on the road to Kyaukpandung.

ORDER HEMIPODII.

FAMILY TURNICIDÆ.

1382. TURNIX PUGNAX.—Bustard Quail.

Found almost everywhere, in suitable localities, but never common in any one place.

1386. TURNIX BLANFORDI.—Burmese Button Quail.

Rare.

ORDER GRALLÆ.

As soon as we arrive at the water birds, waders, herons, storks, etc., the number of common species rapidly increases, as might be expected in a district offering such a variety of suitable localities, as does the coast line of Arakan.

FAMILY RALLIDÆ.

1389. HYPOTÆNIDIA STRIATA.—Blue-breasted Rail.

Very common.

1401. AMAURORNIS PHŒNICURUS.—White-breasted Moorhen.

Very common ; breeds in Akyab town.

1402. GALLINULA CHLOROPUS.—Moorhen.

Common.

1403. GALLICREX CINEREUS.—Kora.

Common.

1404. PORPHYRIO POLIOCEPHALUS.—Purple Moorhen.

Rather rare.

1405. FULICA ATRA.—Coot.

Not common.

Species of *Poozana* and *Rallina* also occur, but I failed to identify any.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FAMILY HELIORNITHIDÆ.

1406. HELIOPAIS PERSONATA.—Masked Finfoot.

One evening, whilst fishing with my friend Mr. Pickthall, in a deep pool on the Ru stream, a bird which we took to be a duck, flew down and settled with a loud grunting quack. My friend fired, and the bird, hard hit, struggled into the elephant grass. On being driven out, it swam and dived well for several minutes, until secured; all the time it kept uttering its monosyllabic grunt. It proved to be a fine male, and the skin is now in Mr. Pickthall's possession. The date was March 9th, 1910.

FAMILY GRUIDÆ.

1409. GRUS ANTIGONE.—The Sarus.

Cranes are not common: the only one I shot proved to be *G. antigone* and not *G. sharpii*.

1411. ANTHROPOIDES VIRGO.—Demoiselle Crane.

On New Year's Day, 1909, I saw three of these birds, which I easily identified with my glass, though they were too wary to allow of my shooting any. There were, apparently, one old and two young birds.

ORDER LIMICOLÆ.

FAMILY ŒDICNEMIDÆ.

1419. ESACUS RECURVIROSTRIS.—Great Stone Plover.

Rare, but I met with it at Kyaukpyu. In N. Aracan I saw birds which were probably *Œ. scolopax*.

FAMILY GLAREOLIDÆ.

1425. GLAREOLA ORIENTALIS.—Large Indian Pratincole.

Very common and resident. In 1909 I was too late for eggs, but found a young bird. In 1910, I determined to get eggs, and after several days' hunting got the knack of it, when my Burman "boy" and I succeeded in finding about twenty nests. The birds were breeding in paddy stubble, near the sea, just outside Akyab town; the nests are best found by flushing the birds, and then watching them return, when they run to the nest and squat down. The nests were all found during the last week in April.

1427. GLAREOLA LACTEA.—Small Indian Pratincole.

Much less common than *G. orientalis*, but resident and breeds.

FAMILY PARRIDÆ.

1428. METOPODIUS INDICUS.—Bronze-winged jacana.

Common.

1429. HYDROPHASIANUS CHIRUGUS.—Pheasant-tailed jacana.

Fairly common.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FAMILY CHARADRIIDÆ.

1430. STREPSILAS INTERPRES.—Turnstone.

Four birds on October 5th, 1909, on the rocks near Fakir point, at Akyab.

1432. SARCOGRAMMUS ATRINUCHALIS.—Burmese Wattled Lapwing.

Common.

1435. HOPLOPTERUS VENTRALIS.—Indian Spur-winged Plover.

Fairly common.

1439. CHARADRIUS FULVUS.—Eastern Golden Plover.

Occurs in vast numbers from September to May, by which time the birds are assuming breeding plumage. I kept one in my aviary for several months, and it throve exceedingly on a diet of white ants. It was liberated in May.

1441. SQUATAROLA HELVETICA.—Grey Plover.

A not uncommon winter migrant.

1442. ÆGIALITIS GEOFFROYI.—Large Sand Plover.

A common shore bird, from August to February or March.

1447. ÆGIALITIS DUBIA.—Little Ringed Plover.

Very common.

1451. HIMATOPUS CANDIDUS.—Black-winged Stilt.

Rare.

1454. NUMENIUS ARQUATA.—Curlew.

Very common. I have seen them as late as June and as early as August.

1455. NUMENIUS PHŒOPUS.—Whimbrel.

Equally common; returns in August, and appears to leave about April or May.

1460. TOTANUS HYPOLEUCUS.—Common Sandpiper.

Very common.

1461. TOTANUS GLAREOLA.—Wood Sandpiper.

Very common.

1462. TOTANUS OCHROPUS.—Green Sandpiper.

Very common.

1463. TOTANUS STAGNATILIS.—March Sandpiper.

Rare.

1464. TOTANUS CALIDRIS.—Redshank.

Very common; August to April or May.

1465. TOTANUS FUSCUS.—Spotted Redshank.

Common.

1466. TOTANUS GLOTTIS.—Greenshank.

Very common; August to March.

1472. TRINGA RUFICOLLIS.—Eastern Little Stint.

Fairly numerous.

1482. SCOLOPAX RUSTICOLA.—Woodcock.

A very rare visitor. One was shot in the winter of 1908.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1484. GALLINAGO CŒLESTIS.—Common Snipe.

Less common than *G. stenura*. The first shot was on September 25th 1910, and on October 10th, 1909. Last shot about end of January.

1485. GALLINAGO STENURA.—Pintail Snipe.

Very plentiful. Arrive between August 20th and 25th and stragglers remain till the end of April.

1488. ROSTRATULA CAPENSIS.—Painted Snipe.

Unaccountably rare, as there are many suitable localities.

ORDER GAVLÆ.

FAMILY LARIDÆ.

1489. LARUS ICHTHYÆTUS.—Great Black-headed Gull.

On November 20th, 1909, I observed three very large Gulls, in company with *G. brunneicephalus*. They were too wary to allow of my shooting one, but from what I could make out through my glass, I think they must have been *L. ichthyætus*.

1491. LARUS BRUNNEICEPHALUS.—Brown-headed Gull.

The Gulls arrived about the end of October, and are then commonly met with throughout the winter. In 1909 they left in Apirl, when most had assumed breeding plumage ; in 1910, breeding plumage was assumed about the same time, but they did not leave till the beginning of May.

1496. HYDROCHELIDON HYBRIDA.—Whiskered Tern.

Commonest in winter, but as there are always a few about, it probably breeds. As the whole country is under water in the rains, there is an ample choice of nesting sites.

1502. STERNA BERGII.—Large Crested Tern.

Very common. According to Hume, they used to breed on Oyster Island, some three hours out from Akyab ! but there is a Lighthouse there now, and this seems to have scared them, as they no longer breed there.

1503. STERNA SEENA.—Indian River Tern.

Rare.

1517. RHYNCOPS ALBICOLLIS.—Indian Skimmer.

Fairly common.

ORDER STEGANOPODES.

FAMILY PELICANIDÆ.

1523. PELECANUS PHILIPPENSIS.—Spotted-billed Pelican.

Common.

FAMILY PHALACROCORACIDÆ.

1526. PHALACROCORAX CARBO.—Large Cormorant.

Common.

1528. PHALACROCORAX JAVANICUS.—Little Cormorant.

Very common.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1529. PLOTUS MELANOGASTER.—Indian Darter.

Very common.

ORDER HERODIONES.

FAMILY IBIDIÆ.

1541. IBIS MELANOCEPHALA.—White Ibis.

Extremely common, but appears to be partially migratory, as most of the birds disappear in the breeding season, and I failed to find nests.

1543. INOCOTIS DAVISONI.—Davison's Black Ibis.

Not uncommon, and usually found in pairs, but very wary. An excellent bird for the table.

FAMILY PLATELEIDÆ.

1545. PLATALEA LEUCORODIA.—Spoonbill.

My first record was a young bird, shot on November 1st, 1908. It was by itself but I subsequently met with several small parties in the same locality both in 1908 and 1909. The place was not far from Akyab, and was the site of an old irrigation tank, now no longer extant, the bund having been destroyed. The birds are probably the remnants of a colony which bred there when the tank contained water.

FAMILY CICONIIDÆ.

1548. DISSURA EPISCOPUS.—White Necked Stork.

Common.

1549. XENORHYNCHUS ASIATICUS.—Black-necked Stork.

Common.

1550. LEPTOPTILUS DUBIUS.—Adjutant.

Common.

1551. LEPTOPTILUS JAVANICUS.—Smaller Adjutant.

Rather rare.

1552. PSEUDOTANTALUS LEUCOCEPHALUS.—Painted Stork.

Common.

1553. ANASTOMUS OSCITANS.—Open-bill.

Not common, but occasionally met with in small parties.

I failed to find the nest of any stork though doubtless they breed in Arakan.

FAMILY ARDEIDÆ.

1554. ARDEA MANILLENSIS.—Eastern Purple Heron.

Very common.

1555. ARDEA CINEREA.—Common Heron.

Very common.

1556. ARDEA SUMATRANA.—Dusky Grey Heron.

Fairly common. Haunts the mangrove swamps and muddy brackish creeks.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1557. ARDEA INSIGNIS.—Great White-bellied Heron.
Occasionally met with on the larger jungle streams.
1559. HERODIAS ALBA.—Large Egret.
Very common.
1561. HERODIAS GARZETTA.—Little Egret.
Very common.
1562. BUBULCUS COROMANDUS.—Cattle Egret.
Very common.
1564. LEPTERODIUS SACER.—Eastern Reef Heron.
Very common.
1565. ARDEOLA GRAYI.—Pond Heron.
Very common.
1568. NYCTICORAX GRISEUS.—Night Heron.
Very common.
1572. ARDETTA CINNAMOMEA.—Chestnut Bittern.
Very common.
1573. DUPETOR FLAVICOLLIS.—Black Bittern.
Very common, generally in nullahs amongst the paddy fields.

ORDER ANSERES.

FAMILY ANATIDÆ.

1584. SARCIDIORNIS MELANONOTUS.—Comb Duck.
Common.
1584. ASARCORNIS SCUTULATUS.—White-winged Wood Duck.
Occasionally met with in N. Arakan, haunting the larger streams.
1587. TADORNA CORNUTA.—Sheldrake.
I obtained one from a party of three on January 31st, 1910, in the Kyaukpyu district. The skin was sent to the Bombay Natural History Society.
1588. CASARCA RUTILA.—Brahminy Duck.
Visits Arakan in enormous numbers in the cold weather.
1589. DENDROCYCNA JAVANICA.—Whistling Teal.
Very common.
1591. NETTOPUS COROMANDELIANUS.—Cotton Teal.
Common.
1594. EUNETTA FALCATA.—Crested Teal.
A single female, February 1909, Kyankpyu district.
1597. NETTIUM CRECCA.—Common Teal.
Common from October to March.
1599. MARECA PENELOPE.—Wigeon.
Obtained two birds from a flock of about 40 on February 1st, 1909, and a single bird in December 1909, Kyaukpyu district.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

1600. DAFILA ACUTA.—Pintail.

Visits Arakan in enormous numbers from December to March, but as there are few decent jheels, the birds are most often seen in the estuaries of rivers, where they are unapproachable.

1601. QUERQUEDULA CIRCIA.—Garganey.

There are generally a few garganeys with the common teal, but they are not very plentiful.

1602. SPATULA CLYPEATA.—Shoveller.

Rare. I did not see any during the season 1908-09, but shot three during 1909-10.

1607. NYROCA BAERI.—Saw about half a dozen altogether, and shot two. In each case the bird was by itself, did not meet with any flocks of *N. ferruginea*, so assume that the single birds which I saw and did not shoot were *N. baeri*.

ORDER PYOPODES.

FAMILY PODICIPEDIDÆ.

1617. PODICEPS ALBIPENNIS.—Indian Little Grebe.

Very common.

This completes my list, which numbers 294 species actually identified.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA." SERIES IV, PART V.

BY

SIR GEORGE F. HAMPSON, BART., F.Z.S., F.E.S.

(*Continued from page* 911 *of this Volume*).

CATOCALINÆ.

2443*a*. HOMOPTERA EREMOCHROA, n. sp.

♀. Head, thorax and abdomen pale grey-brown; palpi white, the extremity of 2nd joint and the 3rd joint blackish; pectus, legs and ventral surface of abdomen white, the fore tarsi black ringed with white. Forewing brownish grey irrorated with black, the costa with numerous black striæ with slight whitish streaks between them; subbasal line represented by black points on median nervure and vein 1; antemedial line black, minutely waved and slightly excurved; reniform a minute lunule with traces of a blackish line from it to inner margin; postmedial line indistinctly double, slightly bent outwards below costa and incurved at discal fold, incurved below vein 4 and excurved at vein 1; subterminal line indistinctly double filled in with grey, angled outwards at vein 7 and excurved at middle; a minutely waved black line just before termen with series of black points in the interspaces. Hindwing brownish grey with dark striæ on inner margin; traces of four waved dark lines on terminal half; a lunulate black line just before termen; cilia whitish with a brown line through them; the underside white irrorated with pale brown except on basal and inner areas, a slight discoidal point and waved blackish terminal line.

Habitat.—BOMBAY, Deesa (Nurse). *Exp.* 24 mill. Type in B. M.

2440*a*. HOMOPTERA RUFICOLORA, n. sp.

♂. Head, thorax and abdomen bright rufous mixed with some ochreous; antennæ blackish; tarsi blackish ringed with whitish. Forewing bright rufous; subbasal line deep rufous, double, waved, from costa to median nervure; antemedial line deep rufous, minutely waved, inwardly oblique; medial line minutely waved, excurved; postmedial line indistinctly double, oblique from costa to vein 6, slightly incurved at discal fold, incurved and minutely waved below vein 4; subterminal line indistinct, brown, excurved below vein 7 and at middle; a terminal series of slight brown striæ. Hindwing greyish white, the veins and terminal area suffused with bright rufous; a postmedial series of minute dark

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

streaks on the veins and a striga at inner margin with another dark striga before it; a terminal series of slight brown striæ; the underside ochreous white, the costal area slightly irrorated with red-brown.

Habitat.—MADRAS, Gooty (Campbell). *Exp.* 32 mill. Type in B. M.

2526*b*. HYPÆTRA PULCHERRIMA, Butl., A. M. N. H., 1892, p. 298.

„ *tepesceus*, Swinh., A. M. N. H. (7) xvi, p. 152 (nec Wlk.).

Head rufous; palpi brown; sides of frons deep brown with fine whitish streaks above; thorax rufous and deep brown; abdomen brown, the dorsal crests rufous. Forewing brown with a violaceous tinge; a black spot on costal area near base finely defined by whitish; a broad deep black antemedial band from costa to just above inner margin, its inner edge defined by a fine whitish line and angled outwards in cell, its outer edge by a whitish band diffused outwardly; a blackish spot on costa above end of cell; an oblique cocked-hat-shaped mark just beyond the cell finely defined by whitish, its upper extremity curved up to below costa and its lower bent inwards to lower angle of cell, its outer edge forming the postmedial line, angled upwards from its lower extremity into cell, then excurved and forming two small black lunules finely defined by white on inner area, a rufous shade beyond it; a small blackish spot below costa towards apex; the terminal area rather darker. Hindwing uniform brown.

Habitat.—ANDAMANS, Port Blair; SINGAPORE; BORNEO; BR. N. GUINEA. *Exp.* 50 mill.

2527*a*. HYPÆTRA HETEROGRAPHA, n. sp.

♂. Antennæ bipectinate with moderate branches, the apical part simple; hindwing with fold between veins 6·7 clothed with glossy scales on upper side. Head, thorax and abdomen reddish brown; tarsi pale. Forewing reddish brown suffused with grey except medial part of costal area; subbasal line represented by a small curved black mark from costal with point below it; a large irregularly triangular black antemedial patch from cell to just above inner margin, its apex connected with the costa by a sinuous line with small black spot before it below the costa; a black point in middle of cell; two sinuous red-brown indistinct medial lines, oblique from costa to lower angle of cell, where there is a black point, and with small diffused spot on its inner edge on discocellulars, below the cell incurved to submedian fold, then bent outwards, an oblique black bar beyond it from costa; an irregular obliquely placed cocked-hat-shaped black patch beyond the cell, its upper extremity forming an oblique line to below the costa and its lower curved inwards to below angle of cell, then with bisinuate line to inner margin; subterminal line indistinct, irregularly waved, angled inwards at discal and submedian folds and with oblique black striga on it below costa; the terminal area somewhat redder brown. Hindwing grey brown with glossy scaling between veins 6·7 and slight dark subterminal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

marks at veins 2 and 1; the underside greyer with slight brown postmedial striga below vein 2.

Habitat.—BURMA, Tenasserim, Moolayit. *Exp.* 48 mill. Type in B. M.

2490*a*. OPHIUSA RUBIDA, Wlk., Journ. Linn. Soc. Zool. vii., p. 179 (1864).

Head and tegulæ deep chocolate red; thorax greyish brown; pectus pale rufous; legs fuscous mixed with grey; abdomen fuscous, the extremity and ventral surface pale grey. Forewing deep chocolate red, the medial area with a greyish gloss to median nervure; a terminal whitish band irrorated with brown, bent outwards to apex and narrowing to tornus; a fine dark antemedial line, very oblique from costa to below the cell, then obsolete; a black point in middle of cell; two minute grey discoidal spots defined by chocolate; a slight dark postmedial line very oblique from costa to vein 6, then obsolete; an indistinct diffused waved brown subterminal line; a fine waved line just before termen; a slight dark terminal line; cilia fuscous with series of whitish points at base. Hindwing fuscous black; an oblique bluish white band from middle of costa to above tornus; the termen narrowly whitish from below apex to submedian fold with a waved brown terminal line; cilia white; the underside grey-white, the terminal area suffused with fuscous, broadly at apex, narrowing to tornus.

Habitat.—ASSAM, Khásis, Jaintias; BORNEO, Sarawak. *Exp.* 76 mill.

2491*a*. OPHIUSA LACTEICINCTA, n. sp.

♀. Head and tegulæ deep chocolate red; thorax greyish; pectus whitish tinged with rufous; legs grey-brown; abdomen fuscous brown, the extremity grey, the ventral surface whitish tinged with rufous. Forewing grey-brown tinged with chocolate deepening towards the brownish white terminal band which is bent outwards to apex and narrows to tornus; a fine dark subbasal line from costa to submedian fold; ante- and postmedial lines dark-brown, very oblique, the latter slightly curved; a black point in middle of cell; two minute grey discoidal spots defined by brown, a diffused brown subterminal line; a fine waved brown line just before termen; a slight brown terminal line. Hindwing greyish brown, the termen and cilia brownish white from apex to vein 1; the underside brownish white, the terminal area tinged with brown.

Habitat.—ASSAM, Shillong (Rawlings). *Exp.* 76 mill. Type in B. M.

PLUSIANÆ.

2667*a*. PLUSIA EXQUISITA. Feld. Reis. Nov. pl. 110, f. 30 (1874).

Head and thorax whitish mixed with brown; metathorax with some black scales; tarsi brownish ringed with white; abdomen white slightly tinged with red-brown. Forewing whitish mostly suffused with rufous brown and slightly irrorated and striated with black; a waved white

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

subbasal line from costa to vein 1 defined by black on inner side; a waved black antemedial line defined by white on inner side and with blue-grey lunules before it in submedian interspace; orbicular pure white, elongate elliptical and conjoined to a large oblique elliptical white spot below the cell; reniform narrow, defined by white and strongly constricted at middle, a black spot above it on costa; postmedial line black, slightly defined by white on outer side, minutely waved below costa, then oblique, somewhat dentate, and angled outwards at vein 3, some blue-grey beyond it between veins 5 and 2; subterminal line black, defined by brown on inner side and white on outer, excurved below costa, angled inwards in discal fold, then somewhat dentate, a fine black terminal line with narrow brown band before it, defined by white striæ on inner side; cilia chequered brown and white. Hindwing bright yellow with broad fuscous terminal band; cilia chequered brown and white.

Habitat.—NATAL; CAPE COLONY; BALUCHISTAN, Quetta. *Exp.* 36 mill.

2677*a*. PLUSIA MEGALOBA, n. sp.

♀. Head fiery red; palpi and antennæ rufous, the latter with the basal joint whitish; thorax rufous, the tegulæ tinged with fiery red and the metathorax with brown; tarsi with slight pale rings; abdomen greyish rufous, the dorsal crests fiery red, the basal crest tipped with black. Forewing rufous with a greyish tinge, the medial area, except towards costa, and the medial part of terminal area suffused with brilliant cupreous red; subbasal line represented by an oblique golden striga from costa defined on each side by some cupreous red; the stigma below the cell silvery white forming a small oblique elliptical spot conjoined to a large conical spot beyond it; orbicular slightly defined by silver, round, open above; reniform with silver bar on inner edge and angled mark on outer; postmedial line slight, silvery defined by brown on inner side, erect, sinuous, some whitish points beyond it on costa; an indistinct irregularly dentate subterminal brown line; cilia grey-brown. Hindwing cupreous brown with a greyish tinge; cilia brown at base, grey at tips.

Habitat.—ASSAM, Khasis (Badgley). *Exp.* 26 mill. Type in B. M.

2681*a*. PLUSIA CHALCOPASTA, n. sp.

Hind tibiæ and 1st joint of tarsi of male fringed with long hair; abdomen with lateral tufts of very long hair.

Head and thorax bronze-brown slightly mixed with greyish, the tegulæ, patagia and metathoracic crests tipped with whitish scales; tarsi slightly ringed with whitish; abdomen red-brown. Forewing purplish grey-brown suffused with golden bronze, the lines golden bronze; subbasal line slight, oblique, from costa to median nervure; antemedial line inwardly oblique, sinuous, a bisinuate striga from it to near postmedial line below the cell, with some purplish grey above it in and below the cell; orbicular and reniform with faint bronze annuli, the former round, the latter oblique elliptical;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

postmedial line oblique, slightly incurved below discal fold; subterminal line more golden with some cupreous bronze on its inner side and dark suffusion before it and beyond it at apex, excurved from below costa to vein 6, then oblique; a terminal series of slight golden striæ. Hindwing fuscous brown with a reddish bronze gloss; cilia whitish with a dark line near base; the underside grey irrorated with brown, the terminal half suffused with brown except the termen.

Habitat.—N. INDIA (Walhouse); MADRAS, Gooty (Campbell), Nilgiris (Lindsay, Hampson); CEYLON, Maskeliya (de Mowbray), Pattipola (Green). *Exp.* 42-48 mill. Type in B. M.

Genus OMORPHINA.

Type.

Omorphina, Alph. Hor. Soc. Ent. Ross., XXVI., p. 452 (1892). . *aurantiaca.*

Proboscis fully developed; palpi obliquely porrect, slender, the 1st and 2nd joints fringed with long hair in front, the 3rd rather long; frons smooth; eyes small, reniform; antennæ of male ciliated; head and thorax clothed with rough hair only and without crests; tibiæ clothed with long hair; abdomen with some rough hair at base but without crests. Forewing short and broad, the apex rounded, the termen evenly curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 fully developed from above angle; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2688*a*. OMORPHINA AURANTIACA, Alph. Hor. Soc. Ent. Ross., XXVI., p. 452 (1892); id. Rom. Mém. ix., p. 41, pl. 1 f. 2. Staud. Cat. Lep. pal., p. 220.

Head, thorax and abdomen black clothed with bright rufous hair; palpi and legs with fuscous hair mixed, the anal tuft pale rufous. Forewing bright rufous, the basal half slightly suffused with fuscous; traces of a sinuous dark antemedial line; orbicular and reniform defined by deep rufous, the former round, the latter narrow; a deep rufous postmedial line, slightly bent outwards below costa, then waved, incurved at discal fold and strongly below vein 4; a minutely waved rufous subterminal line; cilia deep rufous. Hindwing bright orange yellow; the base and inner area suffused with black, confluent with the black discoidal lunule; a narrow black terminal band; cilia pale rufous, with dark line near base; the underside with the blackish suffusion confined to inner area.

Habitat—TIBET; SIKKIM. *Exp.* 24 mill.

NOCTUINÆ.

2300. COSMOPHILA MESOGONA.

Larva. Semi-looper. Grass green with numerous black-centred white

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spots; dorsal and lateral stripes dark-green with pale edges. Food plant wild raspberry in the leaves of which it spins up when pupating. (W. H. Campbell).

2303*a*. COSMOPHILA FIGLINA, Butl., Ill. Het. B. M. vii., p. 71, pl. 131. f. 2 (1889).

♂. Forewing with the termen slightly excurved at middle.

Head and thorax rufous tinged with brown; palpi whitish in front; lower part of frons whitish; antennæ with the basal joint whitish in front; pectus and legs yellowish tinged with rufous; abdomen grey-brown, the basal crest rufous tipped with whitish, the anal tuft tipped with white, the ventral surface yellowish tinged with rufous. Forewing yellow mixed with red, the costal area, cell, and the area from lower angle of cell to termen between vein 5 and submedian fold red-brown with a greyish tinge; a whitish mark at base of inner margin; antemedial line blackish, oblique, waved, excurved at median nervure and above inner margin; orbicular and reniform diffused brown, undefined, the former round with a white point in centre, the latter lunulate; postmedial line black, waved, oblique from costa to below vein 7, at vein 3 retracted to lower angle of cell and again excurved below submedian fold; an indistinct waved subterminal line defined on inner side by brown suffusion, incurved between veins 6 and 4 and below vein 3. Hindwing grey-brown; cilia whitish; the underside whitish with the costal half tinged and irrorated with red, a slight waved postmedial line.

♀. Forewing more uniform purplish brown.

Habitat—PUNJAB, Dharmsála; ASSAM, Khásis; CEYLON, Maskeliya. Madulsima; BURMA, Rangoon. *Exp.* 38 mill.

2318. CHURIA ARCUATA. del. *Anomis figlina*.

2441*a*. POLYDESMA NODUNA; Swinh. A.M.N.H. (7), xvi., p. 152 (1905).

♀. Head and thorax dark sap-green mixed with white; pectus and legs pale red-brown, the tarsi fuscous ringed with white; abdomen pale red-brown, the ventral surface whitish. Forewing dark sap-green irrorated with white; a diffused white fascia below base of cell, the medial area whitish from below costa to above submedian fold, the postmedial costal area whitish; subbasal line defined on each side by whitish, excurved below costa and angled inwards in cell; antemedial line defined on inner side by white to submedian fold, slightly incurved from costa to median nervure, angled inwards in submedian fold, then double and excurved above inner margin; a black discoidal lunule; a rather diffused straight medial line interrupted in cell; postmedial line double filled in with white, oblique and minutely waved from costa to vein 6, inwardly oblique to submedian fold, then excurved and angled inwards on vein 1, some white points beyond it on costa; an oblique dentate white line defined by dark scales on inner side from costa near apex to submedian fold, where

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

there is a wedge-shaped blackish mark beyond it; subterminal line dentate, black defined by white lunules on inner side and connected by slight dark streak with a terminal series of faint striæ; cilia with a fine whitish line at base. Hindwing whitish suffused with glossy ochreous, the veins and terminal area dark-brown; a discoidal lunule, and sinuous postmedial line angled outwards in submedian fold; a subterminal series of white striæ; a white patch at termen and on cilia with a dark patch above it; cilia with a fine pale line at base: the underside whiter irrorated with brown, a black discoidal lunule, sinuous postmedial line, and broad dark terminal band.

Habitat—CEYLON. *Exp.* 42 mill.

2522*a*. ISOURA METAPHÆA, n. sp.

Palpi with the 3rd joint long.

♀. Head, thorax and abdomen red-brown with a purplish tinge; palpi at base, pectus, legs and ventral surface of abdomen whitish tinged with fulvous, the tarsi fuscous with pale rings. Forewing red-brown with a purplish tinge; subbasal line represented by a small black spot below costa, the antemedial line by a black striga from costa, a spot in cell nearer base, and sometimes a slight striga below submedian fold; orbicular represented by a small black spot, the reniform by black points on its inner and outer edges: a more or less incomplete minutely waved black medial line bent inwards to costa; postmedial line represented by a double series of slight black lunules with another series beyond it, bent inwards to costa, then nearly erect; an incomplete minutely waved black subterminal line slightly excurved below vein 7. Hindwing with the basal area brownish ochreous, the rest of wing fuscous brown with a diffused brownish ochreous postmedial band not reaching costa or inner margin; cilia paler; the underside ochreous white with blackish postmedial band from below costa, where it is angled outwards, to submedian fold; the terminal area suffused with fuscous.

Habitat.—CEYLON, Colombo (Mackwood), Kandy (Green). *Exp.* 44 mill. Type in B. M.

2543*b*. BOCULA SINIFERA, n. sp.

♀. Head and thorax red-brown; legs suffused with fuscous; abdomen fuscous brown, the ventral surface whitish suffused with red-brown. Forewing red-brown tinged with fuscous; two indistinct diffused incurved medial lines; a slight pale discoidal spot with minute brown lunule on it: an indistinct pale incurved postmedial line; a pale subterminal line, oblique from costa just before apex to vein 7, then excurved, then strongly bent inwards between veins 6 and 4 and excurved to inner margin near tornus, defined by black on outer side from costa to vein 4, strongly in the sinus; a terminal series of slight pale points; cilia greyish at tips. Hindwing fuscous brown, the cilia greyish; the underside greyish suffused and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

irrorated with brown, a slight discoidal lunule and indistinct diffused curved postmedial line.

Habitat.—ASSAM, Khásis. *Exp.* 40 mill. Type in B. M.

2544 *b.* BOCULA MACOMA, Swinh., A. M. N. H. (7) xviii., p. 410 (1906).

♂. Head and thorax pale rufous slightly irrorated with fuscous; palpi fuscous; forelegs and the tarsi fuscous; abdomen greyish dorsally suffused with fuscous. Forewing pale rufous slightly irrorated with fuscous; a black point on median nervure at origin of vein 2; traces of a very oblique sinuous medial line; postmedial line represented by a very oblique series of minute dark points on the veins; an oblique sinuous fuscous fascia from apex to vein 5 just beyond the postmedial line with a straight black line diffused on outer side from its extremity to inner margin near tornus, the area beyond it tinged with fuscous to the indistinct diffused sinuous subterminal line; a terminal series of small black lunules. Hindwing pale brown suffused with fuscous; the underside grey irrorated with brown, the terminal area suffused with fuscous to vein 2, a slight discoidal lunule and indistinct diffused curved postmedial line.

Habitat—ASSAM, Khásis. *Exp.* 28 Mill.

2555. ACANTHOLIPES HYPENOIDES insert (Syn.) *Rivula magniplaga*, Swinh, A. M. N. H. (7) xvi., p. 622 (1900).

Genus MASCA.

	Type.
Masca, Wlk., xvi. 8 (1858)	*abactalis.*
Phagytra, Wlk., xxxiv. 1508 (1865)	*abactalis.*

Probosis fully developed; palpi obliquely upturned, the 2nd joint reaching to about vertex of head and moderately scaled, the 3rd moderate; frons smooth; eyes large, rounded; antennæ of male ciliated; head and thorax clothed with hair and scales and without crests; fore femora and tibiæ of male broadly fringed with hair, the 1st joint of tarsus with tuft of hair; mid tibiæ broadly fringed with hair; hind tibiæ broadly fringed on both sides with hair and with tuft of very long hair from base; abdomen without crests. Forewing with the apex rectangular, the termen slightly angled at vein 4; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 from above angle: 6·7 from upper angle; 8 anastomosing with the cell near base only.

2616a. MASCA ABACTALIS, Wlk., xvi., 9 (1858).

Phagytra leucogastralis, Wlk., xxxiv., 1508 (1865).

Metria platypoda, Feld., Reis. Nov., pl. 120, f. 44 (1873).

Head and thorax white mixed with reddish-brown; antennæ ringed brown and white: hindlegs with the tufts of hair black at tips: abdomen

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

white with lateral brownish streaks. Forewing with the basal half white tinged and irrorated with brown; the terminal half suffused with fuscous brown; traces of an oblique antemedial line with more prominent spots below the cell and above inner margin; an obscure very oblique dark spot in middle of cell and discoidal spot constricted at middle; the dark terminal area angled inwards below the cell; a minutely dentate postmedial line bent outwards below costa, oblique below vein 4, and angled inwards in submedian fold; two subterminal white points near apex and traces of a subterminal line; a terminal series of dark striæ. Hindwing white, the terminal half of costal area broadly fuscous, on terminal area extending to vein 3; a postmedial series of minute black streaks on veins 5 to 1; a terminal series of black striæ; the underside thickly irrorated with fuscous brown except inner area and terminal area below vein 5, a black discoidal point, curved diffused medial brown band and double postmedial series of brown points.

Habitat.—ASSAM, Khásis; SINGAPORE; BORNEO: PHILIPPINES; JAVA: AMBOINA; CERAM; NEW GUINEA. *Exp.* 46 mill.

2747*a*. EGNASIA MESOTYPA, Swinh., A.M.N.H. (7), xvii., p. 550 (1906).

Head, thorax and abdomen dull reddish brown; palpi irrorated with fuscous, the tuft on 3rd joint black; pectus and ventral surface of abdomen greyish irrorated with fuscous. Forewing dull reddish brown tinged with grey and irrorated with fuscous; a dark oblique antemedial line, incurved in cell; a small round white spot in middle of cell defined by fuscous; an inverted comma-shaped discoidal whitish mark defined by fuscous and with reddish spot in lower part; a dark postmedial line oblique from costa to vein 6, then minutely waved, oblique below vein 5 and with traces of another line beyond it; a curved dentate subterminal line; a fine black terminal line; cilia brown at base, whitish at tips except at middle. Hindwing dull reddish brown tinged with grey and irrorated with fuscous: a whitish discoidal mark defined by black, its outer edge twice indented and with small round spot beyond its lower extremity; a dark slightly sinuous medial line; a dentate subterminal line; a fine black terminal line; cilia brown at base, whitish at tips, intersected by brown at the points; the underside paler with indistinct diffused line beyond the medial line.

Habitat.—ASSAM, Khásis. *Exp.* ♂ 24, ♀ 30 mill.

2748*a*. EGNASIA TENELLA, n. sp.

♂. Head, thorax and the abdomen creamy white, back of head with two brown points, the thorax slightly irrorated with brown, the abdomen faintly tinged with brown; palpi with the extremity of 2nd joint and the 3rd joint ringed with brown; tarsi brownish ringed with white. Forewing creamy white slightly irrorated and striated with brown; a curved subbasal brown striga from costa; antemedial line brown, waved; the discocellulars with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

two brown striæ and two blackish points; a faint medial line excurved to discocellulars; postmedial line brown, excurved from costa to vein 4, then slightly incurved; two minute dark streaks on costa towards apex and traces of a minutely waved white subterminal line with series of blackish points on its outer edge; a fine brown terminal line; cilia tinged with rufous. Hindwing creamy white slightly irrorated with brown; a black discoidal point enclosed by the faint medial line which forms an elliptical annulus round it; a curved brown postmedial line; subterminal line represented by a double series of small brown spots except towards costa, with whitish points between them; a fine brown terminal line; cilia tinged with rufous.

Habitat.—BURMA, Maymyo. *Exp.* 26 mill. Type in B. M.

2762*a*. CAPNODES SUBAPICALIS, Swinh., A.M.N.H. (7), xvi., p. 154. (1905).

♀. Head and thorax fuscous irrorated with white, tibiæ and tarsi pale rufous; abdomen pale rufous dorsally irrorated with fuscous and whitish. Forewing pale rufous irrorated with a few black scales; a blackish patch at base of costa; a black point in middle of cell; an indistinct medial line, strongly incurved below the cell; two black discoidal points edged with whitish; an indistinct dentate rufous postmedial line, oblique towards costa and strongly incurved below vein 4; traces of a waved subterminal line towards tornus; a semicircular brown line from below costa towards apex to termen at vein 5, defined by white on outer side, and connected by diffused fuscous streaks with small subterminal black spots defined by white, below this semicircular patch is a series of black points before termen; a fine black terminal line; cilia marked with fuscous towards apex and with fine black line near tips. Hindwing pale rufous irrorated with a few black scales; two obliquely placed black discoidal points; a minutely waved rufous line from below middle of costa to tornus with a black spot beyond it at tornus; a series of black points just before termen; a fine dark terminal line; the underside yellowish white irrorated with rufous, two discoidal black points, a curved dentate rufous postmedial line, and se ies of black points just before termen.

Habitat.—ASSAM, Silchar; CACHAR. *Exp.* 36 mill.

2772. RAPARNA DIGRAMMA.

Larva.—Fuscous thickly spotted with pale green; intersegmental olive-green bands; an olive-green dorsal stripe with spots on it; an interrupted subspiracular pale green line; the 12th somite somewhat swollen, with an orange band; ventral surface dull green; head flat, bright red; four pairs of prolegs. Food plant. *Ochna sguarrosa*, 5. (W. H. Campbell.)

HYPENINÆ.

2819*b*. BLEPTINA HETEROPALPIA, n. sp.

Antennæ of male minutely serrate and with fascicles of long cilia, some-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

what contorted and fringed with scales above at middle; palpi with the 3rd joint long, from outer extremity of 2nd, oblique, bent forward at extremity, fringed with long hair behind and short scales in front; fore tibia without sheath; forewing with large costal fold on underside.

♂. Head and thorax fuscous brown mixed with grey; tarsi with slight pale rings; abdomen grey suffused with fuscous brown. Forewing grey tinged with brown and irrorated with black; an indistinct sinuous black antemedial line; a diffused black medial shade not extending to costa; reniform whitish with brown centre, elliptical; postmedial line diffused, blackish, incurved below end of cell; subterminal line indistinct, whitish defined on inner side by blackish suffusion, angled outwards at vein 7 and with blackish patch before it, excurved at middle; a terminal series of black points. Hindwing whitish tinged with brown, traces of a diffused antemedial line and curved postmedial and subterminal lines; a terminal series of black striæ; the underside whitish irrorated with brown, a black discoidal lunule, the postmedial and subterminal lines more distinct.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 28 mill. Type in B. M.

2828. BLEPTINA TRIANGULIFERA insert (Syn), *Macna prætextata*, Hering Stett. Ent. Zeit. xliv., p. 98, pl. 1, f. 1 (1903).

2833*b*. MASTIGOPHORUS INDENTIFASCIA, Swinh., A. M. N. H. (7) xvii., p. 283 (1906).

Fuscous brown; palpi with the tuft of hair on inner side ochreous; tarsi ringed with whitish. Forewing with the area to postmedial line greyish fuscous; antemedial line represented by slight dark suffusion; a small deep black spot in middle of cell and rather large deep black discoidal lunule; postmedial line fuscous defined by greyish on outer side, excurved from costa to vein 4, then incurved and minutely waved, subterminal line grey, angled inwards at discal fold and incurved in submedian interspace; a terminal series of slight black lunules. Hindwing with small blackish discoidal spot, postmedial line fuscous defined by grey on outer side, minutely waved, excurved at middle; subterminal line greyish, obsolete towards costa, excurved from vein 6 to 3, then incurved; a terminal series of black striæ; the underside grey irrorated with fuscous, the terminal area suffused with brown, a black discoidal spot, curved minutely waved medial line and pale curved subterminal line defined on each side by fuscous.

Habitat.—BHUTAN; ASSAM, Khásis. *Exp.* 40 mill.

Under MASTIGOPHORUS insert *Oxænanus*, Swinh. Cat. Het. Mus. Oxon, ii. p. 201 (1900) for Sect. ii. Type *brontesalis*.

2838*a*. MASTIGOPHORUS MAGNIPLAGA, Swinh., A. M. N. H. (7) xvi, p. 624 (1905).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♂. Red brown. Forewing with black point at base of costa and subbasal point below the cell, an indistinct pale antemedial line slightly bent inwards to costa, with black point before it in cell and spot beyond it on costa: a large rounded black discoidal patch truncate above and defined by ochreous, with dark brown patch above in on costa and slight oblique pale band beyond it touching its outer edge; postmedial line very indistinct, dark, minutely crenulate, excurved from costa to vein 4, then oblique, a diffused dark patch beyond it on costa; a terminal series of black points. Hindwing with indistinct diffused pale postmedial band with the slight curved brown postmedial line on it; a slight dark terminal line; the underside greyish brown with small black discoidal spot, minutely crenulate postmedial line, and indistinct minutely crenulate subterminal line.

Habitat.—SIKHIM; ASSAM, Khásis. *Exp.* 42 mill.

2868*b*. NODANA DISCOSTICTA, n. sp.

Antennæ of male knotted and contorted at middle; fore tibia with the sheath covering the basal joint of tarsus only, fore and hind legs with a large tuft of hair from femero-tibial joint.

♂. Head, thorax and abdomen ochreous brown tinged with purplish grey; legs with the tufts ochreous. Forewing brown mixed with purplish grey and with slight dark irroration, the costal edge darker; subbasal line blackish, from costa to median nervure; antemedial line black, minutely waved, bent inwards to costa: a round black discoidal spot; postmedial line black, minutely dentate, excurved from costa to vein 4, then incurved, subterminal line whitish, defined on each side by fuscous, almost straight; a terminal series of black points; cilia with a fine pale line at base. Hind wing grey suffused with brown; an indistinct discoidal bar and straight postmedial line from vein 6 to inner margin; subterminal line whitish defined on inner side by fuscous, the white not extending to costa, almost straight from costa to submedian fold where it is angled; a terminal series of black points; cilia with a pale line at base; the underside whitish irrorated with brown, a black discoidal lunule, the postmedial line slightly angled outwards at vein 6 and inwards at discal fold, the subterminal line diffused and slightly angled at veins 5 and 2.

♀. Rather deeper ochreous brown.

Habitat.—CEYLON, Kandy (Green), Peradeniya (Green). *Exp.* 34 mill. Type in B. M.

Genus PILIPECTUS.

Type.

Pilipectus, Beth-Bakn. A. M. N. H. (8) vi., p. 443 (1910) ..... *ocellata.*

Proboscis fully developed; palpi upturned, the second joint reaching to about vertex of head and moderately fringed with hair in front, the 3rd long and slender; fronts smooth, with tuft of hair; eyes large, round;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

antennæ of male ciliated; thorax clothed with scales mixed with long hair, the tips of patagia with very long hair, without crests; mid tibiæ moderately fringed with hair, the hind tibiæ fringed on both sides with long hair, the inner spurs very long; abdomen with some long hair at base and crest on basal segment. Forewing with the apex rounded, the termen rather oblique below vein 4, not crenulate, the inner margin with numerous scale-teeth of scales and long hair; vein 3 from before angle of cell; 5 from above angle; 6 from just below upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 fully developed from just above angle; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2874*b*. PILIPECTUS CYCLOPIS, n. sp.

♂. Head and thorax ochreous white tinged with rufous and mixed with chocolate-brown scales; pectus and legs white, the latter suffused with brown; abdomen white dorsally tinged with brown, the crest at base brown. Forewing covered with fine chocolate-brown and white striæ and with numerous coarser white striæ, the basal half with the dark markings blackish; the veins whitish, antimedial chocolate-red marks above and below vein 1; a chocolate-red patch suffused with plum-colour beyond the cell, an orange spot on its lower part with white point above it, divided by whitish striæ from a semicircular chocolate-red patch defined by whitish beyond it, its middle part suffused with plum-colour and with some white in centre, two fine dark streaks above it below costa; the apex pale rufous without striæ; the termen with blackish marks irrorated and striated with white, the three towards apex small triangular spots, a large triangular patch at vein 5, wedge-shaped patch below vein 3, and rounded patch above tornus. Hindwing white, the apical area suffused with brown. Underside of forewing brown, the tornal area white.

♀. Hindwing almost wholly suffused with brown, the cilia white slightly tinged with brown.

Habitat.—CEYLON, Haldamulla (Mackwood), Matale (Pole); SINGAPORE; BORNEO, Sarawak. *Exp.* 44 mill.

No. 1497. *Cacyparis prunifera*, Swinh. from Sikhim belongs to this genus, the forewing has the outer part of the postmedial patch extending from just below costa to below vein 3 and with yellow marks on it in the interspaces except between veins 6 and 5; *P. ocellata*, B.-Baker. from New Guinea has the fuscous on termen of hindwing in male extending to tornus.

1407*j*. TOLPIA ARGENTESCENS, n. sp.

Head, thorax and abdomen brownish ochreous with a slight silvery gloss; palpi blackish except at tips; tarsi blackish ringed with white. Forewings ochreous with a slight silvery gloss irrorated with rufous, the terminal area suffused with rufous, the costa dark-brown to middle where it expands into a patch; subbasal line represented by a black striga from costa and a point

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in cell; antemedial line brown, oblique from costa to a small black spot in middle of cell, then erect, waved; medial line brown with small black spot on costa, erect, sinuous, with a small white discoidal spot on its outer edge; postmedial line red-brown defined on outer side by whitish, oblique to vein 6, slightly incurved at discal fold, then excurved, incurved below vein 4; subterminal line whitish defined on inner side by red-brown, excurved below vein 7 and at middle; some black striæ on costa towards apex and on termen. Hindwing ochreous white tinged with brown; a fine brown terminal line; the underside with the costal area suffused with brown, a blackish discoidal striga.

Habitat.—CEYLON, Kandy (Green). *Exp.* 14 mill. Type in B. M.

2904*c*. MARAPANA CAUTIPERAS, n. sp.

Head and thorax white mixed with grey-brown; palpi with the 2nd joint red-brown at sides, the 3rd with fuscous ring near tips; frons red-brown at sides; forelegs fuscous in front; abdomen white dorsally suffused with rufous except at base, the basal crest red-brown. Forewing white tinged with rufous, the costal area suffused with brown towards base; a large quadrate patch of red-brown mixed with fiery red and grey on terminal part of costal area, extending down to vein 4 and on inner part to vein 3; subbasal line white, excurved below costa and ending at submedian fold; antemedial line white slightly defined on inner side by rufous, angled outwards at subcostal and median nervures, then oblique; traces of a waved brown medial line; postmedial line white, very oblique and sinuous to vein 4, then inwardly oblique, some white points beyond it on costa; subterminal line white with diffused white patch before it at costa and defined on outer side by brown on the dark area, angled outwards at veins 7 and 4 and slightly incurved at submedian fold, where there is a rufous point on its outer edge; a series of black points just before termen; a fine black terminal line. Hindwing whitish suffused with brown; a dark discoidal point; a whitish postmedial line; traces of a sinuous punctiform subterminal line, a series of black points just before termen and a fine black terminal line; cilia pure white; the underside white irrorated with fuscous, a black discoidal spot, indistinct rufous postmedial line, faint punctiform subterminal line, and series of black points before termen.

Habitat.—CEYLON, Kandy (Mackwood); SINGAPORE (Ridley). ♀. *Exp.* 34 mill. Type in B. M.

2904*d*. MARAPANA DIPLOGRAMMA, n. sp.

♂. Head and tegulæ red-brown slightly tinged with grey; thorax and abdomen grey-brown. Forewing grey-brown suffused with reddish brown on basal costal area, beyond the antemedial line, on postmedial area except towards inner margin, and on terminal area; subbasal line pale, inwardly oblique, from costa to submedian fold; antemedial line double filled in with whitish, erect, slightly incurved in cell; a double discoidal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bar filled in with whitish; postmedial line double filled in with whitish, oblique below vein 4; an oblique grey-white shade from costa before the subterminal line which is indistinctly double filled in with whitish, slightly incurved at discal fold, excurved at middle, and incurved below vein 4. Hindwing grey suffused with fuscous brown; an indistinct postmedial line; cilia pale rufous; the underside whitish irrorated with reddish brown, a dark discoidal lunule, somewhat diffused sinuous postmedial line, and series of points just before termen.

Habitat.—CEYLON, Ambalangoda (Pole). *Exp.* 22 mill. Type in B. M.

2915*b*. RHYNCHINA LEUCOGONIA, n. sp.

♀. Head and thorax brown mixed with grey-white, the metathoracic crest tipped with black; abdomen whitish suffused with brown, the basal crest tipped with black; pectus and ventral surface of abdomen white irrorated with brown. Forewing whitish tinged with purple and suffused with brown and irrorated with black; a diffused whitish fascia above vein 1 to postmedial line where it is met by an oblique whitish band from apex; antemedial line very indistinct, excurved below costa, then oblique and angled inwards on vein 1; a white point at lower angle of cell; postmedial line indistinct, double, angled outwards below costa, then very oblique, some white points beyond it on costa; subterminal line slight, dark, dentate with black streaks, before it below veins 7, 6, defined by whitish on inner side below vein 5, with a slight black mark at submedian fold, then with a pure white lunule before it; a terminal series of black points; cilia with slight white lunules in the crenulations. Hindwing reddish brown; the underside whitish tinged with red-brown, a slight discoidal lunule and indistinct curved postmedial line.

Habitat.—MADRAS, Horsleykonda (Campbell). *Exp.* 34 mill. Type in B.M.

2928*b*. HYPENA THERMOPHÆA, n. sp.

♂. Head and thorax dark red-brown; palpi whitish at base and as tip of 3rd joint; pectus and base of legs whitish; tarsi fuscous ringed with whitish; abdomen grey-brown tinged with rufous, the basal crest tipped with grey, the ventral surface whitish. Forewing dark red-brown irrorated with black; an indistinct waved rufous antemedial line defined by ochreous on inner side; obscure blackish spots at middle of cell and on discocellulars; postmedial line rufous slightly defined by ochreous on outer side, minutely waved, oblique from costa to vein 4, then incurved; a subterminal series of slight black points, and a terminal series. Hindwing uniform reddish brown with a cupreous gloss; the underside with the inner half greyish.

Habitat.—BOMBAY, Ratnagiri (Jayakar). *Exp.* 30 mill. Type in B. M.

2929*a*. HYPENA MESOGRAMMA, n. sp.

♀. Head and thorax black-brown mixed with grey; palpi whitish below; antennæ ringed with whitish; pectus whitish; tarsi fuscous ringed

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with white; abdomen black-brown mixed with grey and with whitish segmental lines, the crests blackish, the ventral surface whitish. Forewing reddish brown mixed with some grey and thickly irrorated with black, the terminal area darker; points of raised black scales with whitish scales in centre at middle of cell and on discocellulars; the postmedial line almost medial, oblique, whitish, defined on inner side by rufous, then by some black scales, some grey points beyond it on costa; subterminal line indistinct, oblique and blackish from costa to vein 6 where it is met by an oblique black streak from apex, then greyish, slightly incurved at discal fold and strongly at submedian fold, a terminal series of black striæ. Hindwing fuscous brown with a greyish tinge; a terminal series of black striæ; cilia whitish at tips; the underside whitish irrorated with red-brown, a blackish discoidal point and terminal series of minute black lunules.

Habitat.—MADRAS, Gooty (Campbell). *Exp.* 16 mill. Type in B. M.

2985*b*. HYPENA MOLYBDOTA, n. sp.

♂. Head and thorax glossy black-brown; abdomen pale brown; palpi white at tips; tarsi ringed with white. Forewing black-brown with a leaden gloss and irrorated with a few white scales; antemedial line black from median nervure to inner margin, waved; a minute rufous spot defined by black in upper part of middle of cell, reniform small, triangular, rufous defined by black; a waved medial shade from lower angle of cell to inner margin; postmedial line black, minutely waved, excurved below costa and at middle, angled inwards at discal fold, incurved below vein 3 and excurved above inner margin, subterminal line white, minutely waved slightly excurved below vein 7 and at middle; a terminal series of minute black lunules defined on inner side by white scales. Hindwing fuscous; a slight waved black postmedial line on inner area; subterminal line whitish, incurved at vein 2; a terminal series of black points; the underside whitish thickly irrorated with fuscous brown, a small discoidal spot, indistinct dark waved postmedial line, and waved whitish subterminal line defined on outer side by fuscous.

Habitat.—MADRAS, Palnis (Campbell); TRAVANCORE, Pirmád (Mrs. Imray). *Exp.* 30 mill. Type in B. M.

2985*b*. HYPENA ATRIRENA, n. sp.

♀. Head, thorax and abdomen reddish brown tinged with grey; palpi black-brown, white at tips; sides of frons black-brown; forelegs tinged with fuscous. Forewing grey suffused with reddish brown; antemedial line indistinct, dark, oblique, waved; a whitish point in middle of cell; reniform black defined by some whitish scales, attenuated above and rounded below; postmedial line slight, dark, minutely dentate, slightly bent outwards below costa and incurved at discal fold and below vein 4; subterminal line indistinct, pale, minutely waved, excurved below vein 7

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and at middle ; a terminal series of black striæ. Hindwing grey suffused with brown ; traces of antemedial and medial lines ; a terminal series of dark striæ ; the underside with slight dark discoidal bar and traces of waved postmedial and subterminal lines.

Habitat.—CEYLON, Wellawaya (Green). *Exp.* 22 mill. Type in B. M.

2988*a*. HYPENA ABNORMALIS, n. sp.

Palpi of male with tuft of ochreous hair from 1st joint in front, the 2nd joint with tuft of long hair from base above, curved forward before the fringe of hair ; antennæ serrate and fasciculate ; the cell with fold on underside containing a tuft of long yellow hair ; the fore coxæ and femora with tufts of hair, the fore tibia with small streak covering the base of torsus.

♂. Head and thorax fuscous brown; abdomen whitish tinged with brown. Forewing grey suffused with reddish brown and irrorated with fuscous ; traces of an erect dark antemedial line ; postmedial line dark, excurved below costa and at middle and incurved at discal fold and below vein 4 ; faint traces of a dark subterminal line, angled outwards at vein 7 ; a terminal series of black points. Hindwing white faintly tinged with brown except the costal area to beyond middle, the inner area strongly tinged with brown ; the underside white slightly irrorated with brown, a dark discoidal point and terminal line from apex to vein 2.

Habitat.—CEYLON, Hatigala (Green). *Exp.* 28 mill. Type in B. M.

2990. BRITHA BIGUTTATA insert (syn.) *Hypena colabalis*, Feld., Reis. Nov., pl. 120, f. 29 (1874).

2996*b*. CHUSARIS RUBRIRENA, n. sp.

♀. Head, throax and abdomen rufous mixed with some ochreous white ; palpi with some black on outer side of 2nd joint at base and extremity, the 3rd joint white with black ring near extremity ; tarsi banded with black. Forewing ochreous suffused with rufous and irrorated with brown especially on costal area ; a brown antemedial mark on costa with traces of the antemedial line arising from it, oblique, sinuous ; reniform oblique, with red centre defined by black except above and whitish bar before it, some dark suffusion beyond it and a blackish striga above it from costa ; postmedial line white and oblique from costa to vein 6, then obsolescent, strongly angled inwards in submedian fold, a blackish patch beyond it on costa ; subterminal line white slightly defined on inner side by red suffusion, angled inwards below costa and at discal fold, the area beyond it suffused with red and with slight diffused black streaks from below costa to vein 4 ; a terminal series of small black spots defined on inner side by white lunules ; cilia white with some black at apex and middle and black line through them between those points. Hindwing blood-red, the terminal area tinged with brown ; a slight dark discoidal point, indistinct curved white postmedial line with slight oblique black striga before it at inner margin, and subterminal series of slight dark spots towards tornus

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with oblique black striga on a white mark before them above inner margin; a series of blackish points just before termen; cilia whitish with blackish line near tips from apex to discal fold; the underside whitish suffused with rufous, traces of waved red medial and postmedial lines, and of a waved white subterminal line defined on inner side by brown and on outer side towards costa, a terminal series of black lunules.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 18 mill. Type in B. M.

3008*b*. HYPENAGONIA FLAVISIGNA, n. sp.

Palpi projecting about one and a half times length of head.

♀. Head, thorax and abdomen dark-brown mixed with grey; palpi with oblique pale band on 2nd joint. Forewing dark-brown mixed with grey; a slight dark subbasal line, angled outwards below costa, then oblique; a slight dark antemedial line, obliquely excurved from costa to median nervure, then oblique; an oblique diffused medial black band from upper angle of cell to inner margin; a minute whitish discoidal lunule; postmedial line indistinct and whitish on costal half, yellowish on inner half, bent outwards below costa and incurved below vein 4, a irregular yellow mark with slight black marks on its edges beyond it between veins 6 and 4, and some white points on costa; a subterminal series of small triangular black spots with white striæ on their inner side; cilia mixed with white at tips. Hindwing grey and yellowish thickly irrorated with dark-brown; a black medial band from upper angle of cell to inner margin; a maculate black postmedial line with some yellow before it; an indistinct blackish subterminal line; a series of black striæ slightly defined on inner side by grey just before termen; a fine black terminal line; cilia mixed with white at tips; the underside white mixed with some yellow and thickly irrorated with black, a small black discoidal spot, medial and postmedial lines, and diffused subterminal shade.

Habitat.— CEYLON, Kalutava (Alston). *Exp.* 16 mill. Type in B. M.

3008*c*. HYPENAGONIA LONGIPALPIS, n. sp.

Palpi projecting about three times length of head, the 3rd joint upturned and tufted with hair at middle.

Head, thorax and abdomen yellowish mixed with rufous and a few black scales; palpi with oblique black line near extremity of 2nd joint, the 3rd joint with black band at middle; tegulæ with some black at tips; tarsi ringed with black. Forewing yellowish mixed with rufous and irrorated with black; a slight waved black subbasal line from costa to median nurvure; a fine minutely waved black antemedial line; a brown medial band edged by slight dark lines, the outer edge slightly angled outwards at lower angle of cell below the minute white discoidal lunule; postmedial line fine, black defined on outer side by white, oblique from costa to vein 6, slightly angled inwards at discal fold, incurved and minutely waved below vein 4, the costa beyond it with alternating black and whitish

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

streaks; the postmedial area with curved series of black points and in female a rounded spot in discal fold with diffused streak from its outer edge to tips of cilia; a subterminal series of small black spots, excurved at middle; a fine waved black terminal line; cilia with whitish line at base of cilia. Hindwing yellowish and white mixed with rufous and irrorated with black; a brown medial band from below costa to inner margin, edged by blackish lines; a postmedial series of black points with minute yellowish lunules on the outer sides; a subterminal series of small black spots defined on inner side by whitish; a fine waved black terminal line; cilia with a whitish line at base and black line at middle; the underside with waved black medial, postmedial and subterminal lines, black discoidal bar, and series of small spots before termen.

Habitat.—CEYLON, Puttalam (Mackwood), Haputale (Alston). *Exp.* 18 mill. Type in B. M.

3008*b*. HYPENAGONIA BRACHYPALPIA, n. sp.

Palpi projecting about the length of head.

♀. Head, thorax and abdomen white; palpi and hinder part of thorax tinged with rufous; fore femora and tibiæ tinged with fuscous; abdomen with rufous band at base and slight fuscous bands towards extremity. Forewing white tinged with rufous except on costal area; antemedial line with black point at costa, then slight, rufous, incurved in cell and excurved in submedian interspace; two black discoidal points; a rather diffused oblique rufous line from lower angle of cell to inner margin; postmedial line fine, brown, with black point at costa, strongly bent outwards below costa, then oblique, slightly incurved at discal fold and somewhat sinuous below vein 4; two slight black streaks on costa towards apex; subterminal line slight, whitish, slightly angled inwards below costa and with rufous mark on its outer edge at middle; a terminal series of black striæ with small rather dentate white marks before them; cilia with fuscous spot at middle. Hindwing white; a diffused rufous antemedial line except on costal area; a black discoidal spot; the medial area with some fuscous irroration; an inwardly oblique dark line from costa towards apex to discal fold; a double very minutely waved subterminal line, the inner line blackish, the outer brown and rather diffused towards apex; a fine black subterminal line except at apex; the underside white slightly irrorated with fuscous, a black discoidal point and slight sinuous postmedial line.

Habitat.—CEYLON, Labugama (Mackwood). *Exp.* 14 mill. Type in B. M.

3014*a*. MECISTOPTERA ALBISIGNA, n. sp.

♂. Head and tegulæ brownish white, the palpi brown irrorated with black, the frons with brown lateral bars, some brown between antennæ and two black points at back of head, the tegulæ black at middle and tips; thorax and abdomen grey-brown irrorated with a few black scales. Forewing grey-brown irrorated with a few black scales; traces of a strongly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

excurved antemedial line; orbicular near end of cell, round, defined by black except below; a comet-shaped mark at end of cell, its upper extremity extending to near costa and its lower to near postmedial line above vein 3, defined by black except above, a white spot on its inner side on discocellulars, a white line on its outer edge and some rufous in centre, some black suffusion beyond it and a slight white streak above its upper extremity; postmedial line black, obsolete, oblique from costa near apex to vein 3, angled outwards at vein 7 and inwards at discal fold, a fuscous mark below vein 2; some white points on costa towards apex; subterminal line slight, grey defined on inner side by black striæ, excurved at middle, and angled inwards at discal and submedian folds; a fine waved black terminal line with an ochreous white mark before it below vein 3 and black-brown spot below 2. Hindwing fuscous brown. the cilia whitish; the underside grey thickly irrorated with brown, a slight dark discoidal striga and indistinct pale curved postmedial line.

Habitat.—MADRAS, Horsleykonda (Campbell). *Exp.* 24 mill. Type in B. M.

2103*a*. RIVULA COGNATA, n. sp.

Mid and hind tibiæ of male fringed with long hair on outer side, the mid tibia with fold containing a tuft of long hair; abdomen with lateral tufts of hair near base meeting ventrally; hindwing with the termen deeply excised at submedian fold, the tornus lobed, the inner area with a fold containing a tuft of black scales on upperside just beyond middle.

♂. Head and thorax red-brown, the patagia ochreous white; pectus and legs ochreous white; abdomen dark-brown mixed with some grey. Forewing ochreous white irrorated with dark-brown, the terminal area suffused with red-brown, the costa dark-brown; subbasal line represented by a whitish striga from costa; antemedial line whitish, angled inwards in cell, then with a large patch of black-brown suffusion before it; a whitish discoidal point on a diffused brown spot; postmedial line whitish slightly defined on inner side by brown, bent outwards below costa near apex, then minutely waved, oblique and incurved below vein 4, some oblique white striæ beyond it from costa; subterminal line represented by a small wedge-shaped whitish mark from costa with black point at its apex, then by a series of black points with whitish points on their inner side and by a whitish striga at tornus. Hindwing fuscous brown; a slight whitish line at base of cilia; the underside ochreous white irrorated with brown, a slight dark discoidal spot and indistinct postmedial line from costa to vein 4.

♀. Thorax and ground colour of forewing uniform red-brown.

Habitat.—BOMBAY, N. Kanara, Karwar (Bell); CEYLON, Kandy (Green). *Exp.* 18 mill. Type in B. M.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The structure of *R. basalis* is similar, but the postmedial line of forewing is straight from below apex to inner margin.

2103*b*. RIVULA SIMULATRIX, n. sp.

Structure of male similar to *R. basalis* and *cognata*, but abdomen and hindwing normal.

♂. Head, thorax and abdomen pale ochreous yellow. Forewing pale ochreous yellow, the terminal area tinged with rufous; antemedial line whitish defined on outer side by a fine brown line and on inner by rufous suffusion except at costa, excurved from costa to submedian fold, then oblique; a whitish point at upper angle of cell on a diffused rufous spot; postmedial line whitish slightly defined on each side by brown, strongly bent outwards below costa, then oblique, straight, some oblique whitish striæ beyond it from costa; subterminal line represented by a whitish striga from costa, then by a series of black points with whitish points on their inner side and a whitish striga at tornus. Hindwing ochreous white tinged with brown especially on terminal area, a fine dark terminal line; the underside ochreous white irrorated with red-brown.

♀. Head, thorax and abdomen red-brown; forewing entirely suffused with red-brown, with deep red-brown suffusion before antemedial line; hindwing dark red-brown, the cilia rufous.

Habitat.—CEYLON, Dickoya (Green), Pundaloya (Green), Nawalapitiya (Pole). *Exp.* 18-20 mill. Type in B. M.

2103*d*. RIVULA PROCRITA, Swinh. A. M. N. H. (7), xvi., p. 621 (1905).

Forewing with vein 10 absent or very short.

♀. Head and thorax white or pale brown mixed with dark red-brown; palpi, pectus, and legs brown, tarsi blackish slightly ringed with white; abdomen fuscous, whitish at base. Forewing white or pale brown slightly irrorated with brown; a red brown patch on costa near base with the indistinct irregularly waved antimedial line arising from its outer edge and expanding into a patch at inner margin; a medial red-brown band expanding into a triangular patch at costa, narrowing at lower angle of cell and expanding into a wedge-shaped patch at median nervure with a >-shaped black mark on it; postmedial line arising from outer edge of the band, bent outwards below costa, incurved below vein 4 and joining the band at inner margin; terminal area red-brown with two white points on costa, an indistinct blackish subterminal line excurved below vein 7 and at middle, a white spot beyond it at apex with five black marks below it and some small white spots towards tornus; a terminal series of black points with white striæ on their inner sides. Hindwing fuscous brown with a slight pale line at base of cilia; the underside whitish tinged with brown, the terminal area suffused with brown, a fuscous discoidal lunule and curved postmedial line.

Habitat.—ASSAM, Khásis; BALI. *Exp.* 22 mill.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

URANIADÆ.

3045*d*. EPIPLEMA FULVIHAMATA, n. sp. (pl. G., f. 14).

Forewing with the termen very slightly angled at vein 6, hindwing with the costa excised beyond middle and produced to points at veins 6 and 4.

Head and thorax red-brown tinged with purplish grey; palpi above and frons black; pectus and legs whitish, the forelegs fuscous above; abdomen grey tinged with brown, the medial segments with blackish dorsal marks. Forewing greyish suffused with purple-brown and striated with blackish; traces of an interrupted waved antemedial line bent inward to costa; postmedial line double tinged with fulvous and oblique from costa to vein 5, then indistinct, pale, and incurved from vein 4 to submedian fold, then defined by black on inner side and slightly excurved; a terminal black point below apex, then a dark band with diffused black and fulvous on its inner edge, angled outwards at vein 6 and ending on termen at vein 2. Hindwing with the costal half purplish, the inner half purplish grey-brown striated with black; a fulvous streak in lower part of cell hooked on discocellulars and with some black beyond its angle; postmedial line ochreous, defined on inner side by brown from costa to discal fold and below vein 4 by black and fulvous, oblique and slightly sinuous from costa to vein 4 where it is acutely angled outwards, then nearly straight; a whitish line from termen at vein 7 to termen at vein 2, defined by black on outer side and produced to termen as short white streaks at discal fold and veins 4·3; the underside brownish white slightly striated with black.

Habitat.—CEYLON, Kandy, Peradeniya (Green); PULO LAUT (Doherty). *Exp.* 22 mill. Type in B. M.

GEOMETRIDÆ.

BOARMIANÆ.

3148*a*. SYNEGIA CONFLAGRATA, n. sp.

♀. Head, thorax and abdomen fiery red mixed with yellow; palpi brownish; frons yellow below and with red and brown bars above; antennæ brown, the shaft above and a line between their bases pure white; pectus and legs ochreous and brownish, the forelegs brown; ventral surface of abdomen whitish. Forewing yellow and fiery red almost entirely suffused with fuscous brown, leaving some of the ground colour at base, as irroration on medial costal area, as ante and postmedial patches on inner margin, as a semicircular patch on termen from apex to vein 4, and lunulate spots towards tornus; an interrupted red and yellow antemedial line, excurved below costa; a postmedial white spot in submedian fold at the apex of the patch on inner margin; some brown striæ on termen; cilia yellow intersected with brown towards apex and at middle. Hindwing yellow suffused with fiery red; some brown at base; a dark discoidal point

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with the indistinct sinuous brown medial line just before it; postmedial line double, fiery red filled in with yellow, waved; a strong brown subterminal line, angled outwards to termen at discal fold and produced as streaks to termen at veins 4, 3, 2; the underside ochreous, a brown subbasal line except towards costa, medial line brown, waved, double towards inner margin, the discoidal point just beyond it, postmedial line brown, curved, waved, the subterminal line connected at discal fold with a lunulate patch on termen.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 36 mill. Type in B. M.

3235. MACARIA SUBALBATARIA.

Larva.—Bistre brown; two black dorsal lines with a white line between them; two fine lateral black lines; ventral surface paler; head bistre brown with black spots. 6 (W. H. Campbell).

3236*a*. MACARIA HONORIA, n. sp.

Head and thorax dark-brown mixed with some grey; palpi ochreous at base and white at tips; frons with white points at sides, antennæ with the basal point white in front; pectus yellow, legs yellow irrorated with brown, the tibiæ and tarsi brown above; abdomen yellow, dorsally dark-brown except at extremity. Forewing purplish grey irrorated and striated with dark-brown, the basal and costal areas suffused with brown, the medial area pale grey except towards costa; an oblique antemedial dark-brown bar from costa; a small black-brown discoidal spot; postmedial line dark-brown, strong oblique and slightly sinuous to vein 7, then bent inwards to discal fold, then slightly oblique, a patch of black-brown above its angle on costal area, then a band of dark-brown suffusion beyond it emitting a diffused fascia from the angle of the line to termen; a terminal series of black-brown points; cilia brownish with white line at base, chequered with dark-brown towards apex. Hindwing purplish grey striated with brown; the basal area suffused with brown, a whitish subbasal spot in cell, its outer edge incurved before the small round black discoidal spot placed on the paler medial area; postmedial line blackish, almost straight, a broad band of brown suffusion beyond it and rather wedge-shaped black patches between veins 6·7 and 4·3, the former extending at extremity to discal fold; the terminal area with dark-brown patch between veins 6 and 4; a terminal series of slight dark lunules; cilia whitish at base, brownish at tips, dark between veins 6 and 4. Underside of both wings with the basal area pale striated with brown, the terminal area fuscous brown with white subapical spot on forewing, the hindwing with some white striæ near inner edge of the dark area and on apical area and an irregular white patch striated with brown at middle of termen.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 42 mill. Type in B. M.

3326*b*. GARÆUS FLAVIPICTA, n. sp.

♂. Head and thorax fiery red; antennæ with the shaft whitish, the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE MOTHS OF INDIA.

Explanation of Plate G.

1. Arbela theivora.
2. Celama leucoscopula.
3. ,, mesotherma.
4. ,, rufimixta.
5. ,, dentilinea.
6. Rœselia pallidiceps.
7. Zia ectrocta.
8. Ilema atrifrons.
9. Halone flavinigra.
10. Asura phantasma.
11. ,, toxodes.
12. ,, fulvimarginata.
13. Neasura taprobana.
14. Epiplema fulvihamata.
15. Cidaria nyctichroa.
16. Gymnoscelis lobata.
17. Chloroclystis dentatissima.
18. ,, polygraphata.
19. Utetheisa pulchelloides.
20. Episilia clavata.
21. ,, arenacea.
22. Lycophotia poliades.
23. Ufeus carnea.
24. Anytus leucocyma.
25. Tichestra serrata.
26. Dichonia chlorata.
27. Chloroclystis plicata.
28. Prasinoxena metaleuca.
29. Melissoblaptes monochroa.
30. Crambus endopolia.
31. ,, neurigrammalis.
32. ,, albiceps.
33. Chilo arœalis.
34. Prorophora dialeuca.
35. Heterographis augentescens.
36. Nephopteryx rhodobasalis.
37. Thermopteryx rubrifusa.
38. Spatulipalpia albistrialis.
39. Lepidogma chlorophilalis.
40. Macalla eumictalis.
41. Trichophysetis umbrifusalis.
42. Bostra mesaleucalis.
43. Oligostigma andreusialis.
44. Massepha rufescens.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

branches brownish, abdomen yellow tinged with red and brown. Forewing fiery red with a few dark striæ, the medial area with diffused yellow patches on costal area and below the cell and an oblique yellow bar from costa before the angle of postmedial line, the costal edge yellowish on basal area; a diffused brownish antemedial line oblique from costa to median nervure, then slightly waved; a black discoidal point; postmedial line dark slightly defined by violaceous on outer side, acutely angled outwards below costa, then oblique; the apex brownish with some violaceous irroration. Hindwing fiery red sparsely striated with black, the terminal area with a faint violaceous gloss; medial area yellow, narrowing towards costa and with slight red marks on its outer edge towards inner margin, bounded by the dark postmedial line which is excurved and minutely waved from vein 4 to inner margin. Underside of both wings yellow striated with black and with diffused patches of rufous suffusion especially on tornal area of forewing and apical area of hindwing which has the postmedial line excurved between veins 4 and 2.

Habitat.—N. ASSAM, Dibrugrah (Ward). *Exp.* 38 mill. Type in B. M.

3528*a*. ABRAXAS DIVERSICOLOR.

Larva.—Dull fuscous; a pale yellow dorsal stripe interrupted at the junction of the somites; spiracular line red with a series of minute red specks above it; head prominent, glabrous, red; legs and preanal claspers red, anal segment and anal claspers whitish. Food plant *Rhododendron*. (W. H. Campbell).

LARENTIANÆ.

3643*a*. CIDARIA NYCTICHROA, n. sp. (Pl. G., f. 15.)

♂. Head, thorax and abdomen reddish brown mixed with some grey and black, the tegulæ, prothorax and abdomen with blackish bands, the metathorax with black crest; pectus, legs and ventral surface of abdomen brownish white, the fore tibiæ and tarsi black with pale rings. Forewing reddish brown suffused with a black and with numerous minutely waved black lines, the double antemedial line and the postmedial line rather more prominent, the latter excurved below costa and at middle; a waved greyish subterminal line and black terminal line. Hindwing red-brown suffused with black and with numerous waved black lines except on costal area which is greyish; a black terminal line; the underside whitish irrorated with fuscous, curved sinuous medial and postmedial blackish lines and a broad diffused subterminal band.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 28 mill. Type in B. M.

3738. PHOTOSCOTOSIA VENIPICTA insert (syn.) *Eustroma pilosa*, Th. Mieg. Le Nat. 1910, p. 34.

3747*b*. POMASIA PUNCTARIA, n. sp.

♀. Head white with blackish bars above from and between antennæ,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the back of head and tegulæ yellow, the latter with blackish patches; palpi blackish banded with white; antennæ brown, the basal joint white in front; thorax brown with white patches on patagia; pectus and legs yellow, the fore and mid tibiæ and tarsi banded with brown; abdomen dark-brown with dorsal series of white spots and segmental lines, the extremity and ventral surface orange-yellow. Forewing brown with numerous waved white lines with series of small spots between them, the apical area and termen with the markings orange-yellow; a white discoidal annulus with white point in centre; the termen with a series of orange lunules concave towards base. Hindwing brown with numerous waved white lines with series of small spots between them, the terminal area with the markings orange-yellow.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 24 mill. Type in B. M.

3754. GYMNOSCELIS SUBTRIGOSA, insert *Eupithecia substristigera*, Wk., XXXV., 1879, (1866); which has precedence.

Larva.—Black; two yellow-green dorsal lines conjoined at the junctions of the somites by bands of the same colour; a spiracular series of yellow-green spots and a few similar spots on the ventral surface; head black, glabrous. Feeds gregariously on a species of low-growing Fig. (W. H. Campbell.)

3755*a*. GYMNOSCELIS LOBATA, n. sp. (Pl. G., f. 16.)

Hind tibia with long inner medial spur, the outer spur absent: hindwing of male with costal lobe folded over on underside, the inner area folded over on underside and grooved.

♂. Head, thorax and abdomen ochreous mixed with reddish brown, the underside ochreous whitish, the fore tibiæ and tarsi fuscous ringed with white. Forewing greyish ochreous irrorated with fuscous; subbasal line represented by slight double dark striæ from costa; antemedial line slight, waved, inwardly oblique, a waved dark band beyond it with the black discoidal striga on its outer edges; a faint double minutely waved medial line; postmedial line double, minutely waved and obliquely curved, with fuscous suffusion on its inner side; subterminal line pale, minutely waved, with fuscous suffusion on its inner side, the area beyond it purple; a fine dark terminal line; cilia ochreous and fuscous. Hindwing greyish ochreous irrorated with fuscous; traces of double waved ante and postmedial lines; a rather punctiform blackish subterminal line, the area beyond it tinged with purple; a fine black terminal line; cilia ochreous and fuscous. Underside of forewing suffused with purple except the inner area to beyond middle, a curved whitish postmedial band with deeper purple before and beyond it; hindwing whitish, the costal fold fulvous, an obliquely curved purple postmedial band from costa to vein 4 and a terminal band.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

♀. Head and abdomen more fulvous; wings tinged with green; forewing with the suffusion before postmedial and subterminal lines rufous, no purple on termen; the underside with the purple replaced by brown.

Habitat.—CEYLON, Madulsima (Vaughan), Maskeliya (Alston), Ambawela (Green), Hakgala (Green). *Exp.* ♂ 18, ♀ 20 mill. Type in B. M.

3770*b*. CHLOROCLYSTIS DENTATISSIMA, Warr., Nov. Zool., v., p. 428 (1898). (Pl. G., f. 17.)

♀. Head, thorax and abdomen grey tinged with reddish brown; palpi fuscous towards tips; fore tarsi brown ringed with whitish. Forewing grey suffused and irrorated with brown; subbasal line represented by a black striga from costa, the antemedial line by black striæ from costa and inner margin and at median nervure, inwardly oblique; a blackish point on middle of costa; postmedial line faint, waved, with short black streaks on the veins, oblique from costa to vein 6, angled inwards at discal fold and oblique below vein 4; subterminal line whitish, minutely dentate, defined on inner side by slight dark streaks on the veins; a terminal series of black striæ with minute streaks before them in the inter spaces. Hindwing grey suffused and irrorated with brown; indistinct minutely waved, subbasal antemedial and medial lines; postmedial line blackish, curved, slightly incurved at discal fold, with another faint line beyond it; subterminal line whitish defined on inner side by brown, minutely dentate; a terminal series of black striæ; the underside brownish white with curved dark medial and postmedial lines except on inner area, a fine black terminal line.

Habitat.—CEYLON, Peradeniya (Green). Colombo (Mackwood); Cocos KEELING I; KEY IS; N. AUSTRALIA, Port Darwin. *Exp.* 18-22 mill.

3770*c*. CHLOROCLYSTIS POLYGRAPHATA, n. sp. (Pl. G., f. 18.)

♀ Head, thorax and abdomen grey mixed with fuscous and tinged in parts with rufous; palpi, sides of frons, pectus and legs blackish, the tarsi slightly ringed with white. Forewing grey, slightly tinged with reddish brown and irrorated with fuscous; subbasal line double, curved, from costa to submedian fold, the inner line indistinct, antemedial area with two indistinct waved lines, the antemedial line black, diffused and oblique to median nervure, then minutely waved, the medial area with two lines, oblique to just below cell, then minutely waved; a strong black postmedial lunule with blackish patches above it on costa and black points below it on veins 3 and 2; postmedial line fine, on a pale band slightly angled outward at vein 6, oblique to below vein 4, then minutely waved, a diffused lunulate dark line beyond it; subterminal line whitish defined on each side by fuscous, minutely waved; cilia fuscous intersected with whitish. Hindwing grey tinged with brown; a black mark on base of median nervure and two spots an inner margin; two obscure antemedial lines angled outwards at middle and interrupted in submedian inter space; postmedial line double,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the inner line with slight dentate black marks before it on median nervules, angled outwards at middle, then incurved and minutely waved ; subterminal line double, maculate, oblique from costa to vein 3 where it is obtusely angled ; a series of fuscous spots just before termen from apex to vein 3 ; cilia tinged with ochreous and with series of fuscous spots at base. Underside of both wings suffused with fuscous brown ; hindwing with obscure maculate postmedial line excurved at middle.

Habitat.—CEYLON, Hakgala (Green). *Exp.* 28 mill. Type in B. M.

3773*b*. CLOROCLYSTIS PLICATA, n. sp. (Pl. G., f. 27.)

Forewing of male with the costa folded over on upperside from before middle to towards apex.

Head, thorax and abdomen grey suffused with reddish brown, palpi blackish except at base, the tips of 3rd joint white. Forewing grey suffused with red-brown and with some black irroration on the veins; antemedial line indistinct, double, waved ; three oblique blackish striæ from medial part of costa ; postmedial line indistinct, double, minutely waved, excurved to vein 4, then oblique ; subterminal line grey, minutely waved, with slight black streaks before it below costa and at middle and beyond it in the inter spaces ; a terminal black line. Hindwing grey suffused with red-brown, the median nervure and veins beyond lower angle of cell irrorated with black to the indistinct double whitish postmedial line which is excurved at middle ; an indistinct dentate whitish subterminal line ; a black terminal line.

Habitat.—CEYLON, Hakgala (Green), Ohiya (Green), Newara Eliya (Mackwood), Horton Plains. *Exp.* 26 mill.

ACIDALIANÆ.

3925. EPHYRA VALIDARIA, insert (syn.) 4076*a*. *Geometra rufifrontaria*.

3971*a*. TIMANDRA FLAVISPONSARIA, n. sp.

Head rufous ; antennæ whitish towards base and with white bar between their bases ; thorax yellow tinged with rufous ; legs rufous ; abdomen yellow tinged with rufous. Forewing ochreous yellow, the costal and terminal areas suffused with rufous and irrorated with blackish ; antemedial rufous points on median nervure and vein 1 ; a minute rufous discoidal spot ; traces of an oblique postmedial line defining the rufous terminal area, obsolete towards costa and excurved between vein 5 and submedian fold ; subterminal line with diffused oblique blackish streak from apex, then represented by a series of black points ; a fine red-brown terminal line ; cilia rufous. Hindwing ochreous yellow slightly striated with brown, the terminal half suffused with rufous ; an oblique red-brown medial line with rufous band beyond it and fuscous patch on costal area ; a brown postmedial line excurved between veins 4 and 2 ; a fine red-brown terminal line ; cilia rufous. Underside of both wings tinged with rufous

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and prominently striated with blackish, the postmedial line black, excurved between veins 5 and 2, a black terminal line ; forewing with black discoidal spot.

Habitat.—MADRAS, Wynâd (Cardew), Nilgiris (Andrewes); BURMA, Katha (Bingham). *Exp.* 30 mill.

PYRALIDÆ.

GALLERIANÆ.

4141*c*. PRASINOXENA METALEUCA, n. sp. (Pl. G., f. 28).

♂. Head, thorax and abdomen white, the patagia green. Forewing apple-green with two brownish grey discoidal points and one in discal fold beyond the cell; the costal edge brown towards apex; cilia white with waved brown line at base and fuscous tips. Hindwing white. Underside of forewing with the fringe of hairy scales on and beyond median nervure ochreous white.

Habitat.— CEYLON, Kandy (Mackwood). *Exp.* 16 mill. Type in B. M.

4144*c*. MELISSOBLAPTES MONOCHROA, n. sp. (Pl. G., f. 29).

♂. Head, thorax and abdomen brownish white. Forewing pale brownish ochreous, sparsely irrorated with black; a subbasal black point in cell; a series of black points on costa towards apex and on termen from apex to vein 2. Hindwing uniform pale brownish ochreous.

Habitat.—CEYLON, Ambalangoda (Pole). *Exp.* 32 mill. Type in B. M.

CRAMBINÆ.

4156*b*. CRAMBUS ENDOPOLIA, n. sp. (Pl. G., f. 30).

♂. Head and thorax pale grey-brown; pectus, legs and abdomen whitish tinged with brown. Forewing pale grey-brown, the inner area paler to submedian fold, the veins beyond the cell slightly streaked with whitish and defined above and below by faint brown streaks; traces of a brown point at middle of vein 1 and discoidal point; an indistinct highly curved postmedial brown line. Hindwing white tinged with brown; the underside with the inner area whiter.

Habitat.—CEYLON, Wellawaya (Green). *Exp.* 26 mill. Type in B. M.

4169*a*. GRAMBUS NEURIGRAMMALIS, n. sp. (Pl. G., f. 31).

Head and thorax white, sides of palpi, antennæ and patagia golden bronze; abdomen white faintly tinged with ochreous. Forewing white; a diffused golden bronze fascia on costal area to subterminal line and another on median nervure to well beyond angle of cell; a black discoidal spot; the veins beyond the cell defined by fine golden bronze streaks; a double highly curved subterminal line with small wedge shaped black-brown mark beyond it on costa; a black-brown terminal line. Hindwing white with a slight bronze terminal line from below apex to submedian fold.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Habitat.—CEYLON, Ambalangoda (Pole). *Exp.* ♂ 16, ♀ 18 mill. Type in B. M.

4178*b*. CRAMBUS ALBICEPS, n. sp. (Pl. G., f. 32).

♀. Head and thorax grey tinged with brown, the vertex of head whitish; abdomen white tinged with brown. Forewing grey tinged with reddish brown and thickly irrorated with brown; a slight blackish discoidal point and blackish terminal line; cilia with a silvery gloss. Hindwing white tinged with brown, the cilia white; the underside white faintly tinged with brown.

Habitat.—CEYLON, Haputale (Alston). *Exp.* 18 mill. Type in B. M.

4202*c*. CHILO ARÆALIS, n. sp. (Pl. G., f. 33).

Forewing with vein 8, 9, 10 stalked, 11 anastomosing with 12.

♂. Head, thorax and abdomen pale ochreous yellow; forelegs brownish, the tibia and tarsus whitish in front. Forewing pale ochreous yellow slightly irrorated with brown and the veins defined by faint brown streaks; traces of an oblique antemedial brown line from vein 2 near base to vein 1; a triangular blackish discoidal spot with a brownish streak from it to termen; postmedial line rather oblique and formed of faint dark streaks from costa to vein 6, then very oblique to middle of inner margin and minutely dentate; two black points on termen above tornus. Hindwing white; the underside with the costal area tinged with ochreous.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 26 mill. Type in B. M.

4203. CHILO SIMPLEX.

Larva.—Pinkish grey sparsely covered with fine hairs; two faint pale brown dorsal stripes; a diffused lateral band of the same colour; a supra-spiracular series of small black specks; in some cases the whole body is suffused with brown; head red, glabrous; thoracic plate horny. Feeds in the heads and stems of the great millet and *Holcus spicatus*, boring down into the head as the ear is formed and settling in the stem in which it pupates; the whole upper part of the plant rots; very destructive. (W. H. Campbell).

4205. CHILO SUPPRESSALIS, insert (syn). *Chilo auricilia* Dudgeon. J. Bomb. Soc. xvi., p. 405 (1905).

Food plant Sugarcane.

ANERASTIANÆ.

4279*a*. AMBALA ALBIVENALIS, n. sp.

Maxillary palpi flattened against frons; antennæ of male strongly laminate and with ridge of scales in sinus at base of shaft; hindwing with veins 3 and 5 stalked to near termen.

Head and thorax white mixed with rufous; abdomen white dorsally suffused with fulvous yellow at base. Forewing ochreous tinged with rufous and slightly irrorated with black, the veins prominently streaked with white; an antemedial black point on vein 1; a postmedial black point

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on vein 1 and usually an oblique striga between veins 5 and 2; a terminal series of slight black points. Hindwing white with a faint ochreous brown tinge; the cilia pure white.

Habitat.—CEYLON, Puttalam. (Pole) 1 ♂, 1 ♀, Haputale (Alston) 1 ♂, Kegalle (Alston) 1 ♂. *Exp.* 12-20 mill.

4285*a*. ANERASTIA CASTANEALIS, n. sp.

♀. Head, thorax and abdomen chestnut-red; pectus, legs and ventral surface of abdomen paler, the tarsi fuscous ringed with white. Forewing pale chestnut-red, deeper red towards costa; the ante-and postmedial lines represented by traces of short deep red streaks. Hindwing white, the costa and termen slightly tinged with brown; the underside with the costal area tinged with brown.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 16 mill. Type in B. M.

4299*a*. SALURIA HEMIPHÆALIS, n. sp.

Head and thorax fuscous, the metathorax rufous; abdomen grey dorsally tinged with rufous. Forewing with the costal half fuscous, the inner half rufous, the costal area with a white fascia tapering to a point just before apex. Hindwing semihyaline whitish tinged with brown; cilia whitish with a brown line through them.

Habitat.—CEYLON, Haldamulla (Mackwood), Haputale (Alston). *Exp.* 22·26 mill. Type in B. M.

4304*b*. CRITONIA OCHRACEALIS, n. sp.

Palpi of male oblique, the 2nd joint hollowed out to receive the brush like maxillary palpi; antennæ serrate, with large tuft at base of shaft.

Head and thorax brownish ochreous; abdomen ochreous. Forewing ochreous with a brownish tinge below costal area from base to apex; the costal edge blackish at base; a blackish antemedial point on vein 1; an ill-defined blackish discoidal spot; an oblique postmedial series of blackish points on the veins; an oblique blackish bar from apex and terminal series of black points. Hindwing semihyaline ochreous, the costal area tinged with brown towards apex; a fine dark terminal line. Underside of forewing suffused with fuscous brown, except on inner and terminal areas, more extensively suffused in female.

Habitat.—PUNJAB; Kangra Valley (Dudgeon); MADRAS, Nilgiris (Andrewes). *Exp.* ♂ 26, ♀ 30 mill. Type in B. M.

4312. POLYACHA DEPRESSELLA insert (syn). *Polyocha saccharella* (Dudgeon) J. Bomb. Soc. xvi, p. 405 (1905).

This belongs to Sect. II; but the forewing has veins 4·5 approximated for some distance and veins 10 from the cell, hindwing with veins 3 from angle of cell and 8 free.

Larva on sugarcane.

4326*a*.—HETEROGRAPHIS ARGENTESCENS, n. sp. (Pl. G., f. 35).

♀. Head and thorax rufous with some silvery scales; antennæ blackish

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

abdomen ochreous brown. Forewing ochreous mostly suffused with bright rufous; traces of an oblique dark antemedial line with silvery scales before it towards inner margin; an oblique medial band of silvery suffusion; an indistinct oblique dark postmedial line with band of silvery suffusion beyond it; the inner margin blackish from near base to a dark brownish batch at tornus; cilia silvery whitish at tips. Hindwing ochreous brown, the cilia silvery white except at base.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 20 mill. Type in B. M.

PHYCITINÆ.

Genus PROROPHORA.

Type.

Prorophora, Rag., Ann. Soc. Ent. Fr. 1887, p. 252 .....*curvibasella.*

Proboscis well developed; palpi down-curved, typically extending about the length of head; maxillary palpi slightly tufted with hair; frons with pointed prominence hidden in a tuft of hair; antennæ of male almost simple. Forewing long and narrow, the apex rounded; vein 3 from angle of cell; 4·5 on a long stalk from above angle; 8·9 stalked; 10·11 from cell. Hindwing with vein 3 from angle of cell; 4·5 on a long stalk; 6·7 from upper angle; 8 not anastomosing with 7.

4335*b*. PROROPHORA DIALEUCA, n. sp. (Pl. G., f. 34).

Palpi extending twice the length of head.

♀. Head, thorax and abdomen grey suffused with brown. Forewing grey suffused with brown and slightly irrorated with fuscous; a white streak above median nervure from before middle of cell to termen at discal fold, emitting minute spurs on bases of veins 4·3; slight fuscous medial marks on median nervure and vein 1, and a postmedial series of minute diffused streaks on the veins, oblique below vein 4; the veins slightly streaked with whitish towards termen which is more strongly irrorated with brown. Hindwing semihyaline white, the termen faintly tinged with ochreous brown.

Habitat.—CEYLON, Elephant Pass (Mackwood), Jaffna (Mackwood). *Exp.* 24 mill. Type in B. M.

Genus HYPHANTIDIUM.

Type.

Hyphantidium, Scott., Proc. Zool. Soc., 1859, p. 207 .. *sericaria.*
Assara, Wlk., xxvii, 79 (1863) .. .. *albicostalis.*
Cateremna, Meyr., Pr. Linn. Soc., N. S. W., vii, p. 156 (1882) .. .. *microdoxa.*
Seneca, Hulst., Trans. Am. Ent. Soc., xvii, p. 177 (1890).. *tumidella.*

4345. HYPHANTIDIUM ALBICOSTALIS, Wlk., xxvii, 80 (1869); Rag. Rom. Mém., viii, p. 73, pl. xxv., f. 14.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Euzophera subterebrella, Snell., Tijd. V. Ent., xxiii, p. 250 (1880); id., xxvii, p. 54, pl. v., f. 12.

„ *nivricostella*, Hmpsn., Moths. Ind., iv., p. 74 (1896).

4354*a*. NEPHOPTERYX NEPHELOALIS, n. sp.

♀. Head, throax and abdomen grey suffused with brown; pectus and ventral surface of abdomen whitish; tarsi blackish ringed with white. Forewing grey suffused with brown; some diffused whitish from base of costa followed by a dark shade; an oblique whitish diffused antemedial band with the slight double brown antemedial line on its outer edge followed by a blackish shade from costa to median nervure; two obliquely placed blackish discoidal spots; subterminal line whitish defined on each side by dark lines and with slight oblique dark shade from its inner side at costa, slightly excurved at middle and very minutely waved; a terminal series of blackish points. Hindwing pale suffused with brown; cilia whitish with a brown line near base.

Habitat.—CEYLON, Trincomali (Green). *Exp.* 20 mill. Type in B. M.

4359*d*. NEPHOPTERYX RHODOBASALIS, n. sp. (Pl. G., f. 36.)

Antennæ of male with large tuft of scales from basal joint and sinus at base of shaft but without tuft of scales in it; the tibiæ broadly scaled; large black anal and genital tufts with some silvery scales in them.

Head and thorax ochreous tinged with rufous; tibiæ and tarsi banded with blackish; abdomen fuscous, ochreous at base. Forewing with the basal area whitish tinged with pink and rufous and with dark patches on costa at base and before middle; antemedial line double, oblique, formed of raised blackish and silvery scales; the rest of wing fuscous mixed with greyish; two obscure discoidal spots with some whitish before and beyond the lower; subterminal line indistinct, double filled in with whitish, the inner line minutely dentate, slightly incurved below costa; a terminal series of black points; cilia with a fine whitish line at base followed by a dark line. Hindwing semihyaline whitish, the veins and a terminal line brown; cilia with a dark line near base.

Habitat.—CEYLON, Madulsima (Vaughan). *Exp.* 18 mill. Type in B. M.

4359*e*. NEPHOPTERYX ACROBASELLA, n. sp.

Maxillary palpi of male dilated with scales and flattened against the frons; antennæ with sinus at base containing a tuft of scales; thorax with tufts of long hair from below base of hindwing.

Head and thorax grey mixed with some red and pale olive brown, the tarsi fuscous ringed with white; abdomen brownish ochreous with grey and fuscous bands. Forewing grey irrorated with purplish red; some olive ochreous on basal inner area; the first line medial, blackish, oblique, straight, with a conical olive ochreous band before it, not quite reaching costa, and defined on inner side by band of raised blackish, red and silvery

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

scales from cell to inner margin; two black discoidal points; an olive ochreous postmedial band from submedian fold to inner margin; subterminal line whitish defined on inner side by black and on outer by red, almost straight, oblique; a fine black terminal line; cilia whitish with an ochreous line at base followed by a fine dark line. Hindwing semihyaline whitish tinged with brown; a blackish terminal line; cilia with a dark line near base.

Habitat.—CEYLON, Hambantota (Bainbrigge-Fletcher). *Exp.* 18 mill. Type in B. M.

4370*d*. NEPHOPTERYX FERREOTINCTA, n. sp.

♀. Head, thorax and abdomen grey-brown mixed with whitish; tarsi fuscous ringed with white; abdomen with brownish dorsal bands towards base, the anal tuft ochreous, the ventral surface white. Forewing white, thickly irrorated and suffused with grey-brown and with some rufous especially on inner area before and beyond the subterminal line; antemedial line ill-defined, whitish, with diffused black patch before it on inner half and diffused white patch beyond it, oblique from costa to submedian fold, then incurved: two indistinct conjoined brown discoidal points; subterminal line white, slightly angled inwards at discal and submedian folds; a terminal series of blackish points; cilia with a white line near base. Hindwing semihyaline whitish, the costal area tinged with brown; a fine brown terminal line and line near base of cilia.

Habitat.—CEYLON, Matale (Pole). *Exp.* 20 mill. Type in B. M.

Genus THERMOPTERYX, nov.

Type.—*T. rubrifusa.*

Palpi upturned, the second joint reaching about to vertex of head and moderately fringed with scales in front, the third short; maxillary palpi slightly dilated with scales; frons smooth; antennæ of female almost simple; tibiæ slightly fringed with hair. Forewing with veins 2-3 on a long stalk; 4-5 closely approximated for about half their length and not in line with median nervure; 6 from upper angle; 8-9 stalked and 10 closely approximated to them for about half its length. Hindwing with vein 3 from angle of cell; 4-5 strongly stalked; 6-7 from upper angle; 8 not anastomosing with 7; the cell about half length of wing.

4382*a*. THERMOPTERYX RUBRIFUSA, n. sp. (Pl. G., f. 37.)

♀. Head, thorax and abdomen grey-white suffused in parts with rufous; palpi fuscous. Forewing grey-white irrorated with rufous; a patch of rufous suffusion on basal costal area; the inner area suffused with rufous from before middle where it extends almost to costa and thence obliquely to termen between veins 3 and 2; a patch of rufous suffusion at apex; two rufous discoidal points; a greyish subterminal line, slightly bent outwards at discal fold, then minutely waved; a terminal series of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

rufous points. Hindwing semihyaline white, the costal area faintly tinged with rufous towards apex.

Habitat.—CEYLON, Trincomali (Green). *Exp.* 28 mill. Type in B. M.

4383*c*. MYELOIS ATRIMACULALIS, n. sp.

♀. Head, thorax and abdomen grey mixed with red-brown, the pectus, legs and ventral surface of abdomen greyer. Forewing grey suffused with red brown ; a small subbasal black spot below costa ; small antemedial black spots just below costa and on vein 1 ; a rather large blackish spot at lower angle of cell with two black points above it : a minutely dentate postmedial dark line from below costa to submedian fold, the veins beyond it with slight dark streaks ending in minute terminal black points. Hindwing greyish tinged with brown especially on apical area.

Habitat.—CEYLON, N. C. Province (Pole). *Exp.* 18 mill. Type in B. M.

4385*a*. PHYCITA UMBRATALIS, n. sp.

♂. Head and thorax grey-brown mixed with some fuscous ; abdomen grey-brown ; the tarsi with slight pale rings. Forewing grey suffused with fuscous-brown ; antemedial line diffused, brown, curved, with black points before it on median and submedian nervures ; a black discoidal point ; the veins of postmedial area with short black streaks ; subterminal line grey defined on inner side by black and on outer by red-brown ; a terminal series of black points ; cilia grey with brown lines at base and middle. Hindwing greyish white with fine brown lines on termen and near base of cilia.

Habitat.—MADRAS, Horsleykonda (Campbell). *Exp.* 18 mill. Type in B.M.

4389*c*. PHYCITA MELANOSTICTA, n. sp.

♀. Head, thorax and abdomen grey suffused with brown ; tarsi fuscous ringed with white ; ventral surface of abdomen white. Forewing grey suffused with brown and clouded in parts with fuscous ; the first line medial, double, brown filled in with white and defined on outer side by white, slightly excurved below costa and with short black streak before it above vein 1 ; a slight curved black striga on upper discocellular and a blackish shade beyond the cell bent inwards below vein 4 ; postmedial line white, rather oblique from costa to vein 4 and slightly angled inwards in submedian fold ; a terminal series of dark points. cilia whitish with a fine brown line near base. Hindwing semihyaline white. the costal area tinged with brown towards apex ; a fine brown terminal line and line through the cilia.

Habitat.—CEYLON, Peradenya (Green), Habarana (Green). *Exp.* 22-24 mill. Type in B.M.

4393*a*. PHYCITA MIMELLA, Rag., Bull. Soc. Ent. Fr. 1889, p. ccxviii ; id. Rom. Mém. vii, p. 163, pl. viii, f. 3.

♀. Head, thorax and abdomen grey mixed with brown, the tarsi with pale rings. Forewing grey tinged in parts with brown and rather thickly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

irrorated with black; antemedial line indistinctly double, oblique from costa to submedian fold and incurved at vein 1, a brownish patch before it in and below the cell, defined on inner side by a black bar; two small black discoidal spots; postmedial line indistinct, brown defined on outer side by whitish, arising below costa, oblique to vein 6, then minutely waved and somewhat bent outwards to inner margin, an oblique blackish shade beyond it from costa; a terminal series of black points; cilia white tinged with brown. Hindwing semihyaline white, the veins and costa towards apex tinged with brown; a fine brown terminal line from apex to vein 1; cilia with a fine brown line near base from apex to vein 1.

Habitat.—CEYLON, Kegalle (Alston); NEW GUINEA, Port Moresly. *Exp.* 18 mill.

4421*b*. SPATULIPALPIA ALBISTRIALIS, n. sp. (Pl. G., f. 38.)

Palpi of male with the second joint strongly dilated with a fold enclosing the brush-like maxillary palpi and fringed with hair on outer side at extremity; frons hollowed out; antennæ with the basal joint large, the shaft with sinus at base enclosing a large tuft of scales, then laminate; the vertex of head with ridge of scales; forewing with veins 8, 9, 10 stalked; hindwing with the lower angle of cell very strongly produced to half the length of wing, the median nervure and discocellulars closely approximated, veins 3, 4, 5 from angle, 4, 5 closely approximated for about one-third length.

♂. Head, thorax and abdomen bright rufous, the second joint of palpi in front, the basal joint of antennæ and tuft of scales in sinus, and the tegulæ at middle ochreous; tibiæ and tarsi banded with dark brown. Forewing bright rufous with fine blackish streaks on the veins; a silvery whitish streak below base of cell; antemedial line silvery whitish, strongly angled outwards in cell, then running inwards as a streak above median nervure to near base and on inner area represented by an oblique streak to inner margin with a streak from it above vein 1 to postmedial line; a silvery whitish streak in lower extremity of cell and short streaks in the interspaces beyond the cell; a blackish discoidal spot; postmedial line silvery whitish, arising from costa near apex, acutely angled inwards in discal fold and outwards at vein 5, then oblique to just above vein 1 to which it is slightly bent outwards; a fine black terminal line; cilia whitish at base and tips with fine red lines through them, brown at middle. Hindwing whitish tinged with brown; cilia with whitish line at base followed by a brown line.

Habitat.—CEYLON, Maskeliya (Alston), 1 ♂. type. *Exp.* 20 mill.

4421*c*. SPATULIPALPIA ALBICOSTALIS, n. sp.

♂. Head and tegulæ white slightly tinged with brown; thorax and abdomen pale brown, the anal tuft, pectus, legs and ventral surface of abdomen white tinged with ochreous. Forewing pale ochreous brown, the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

costal area white slightly irrorated with brown; obliquely placed antemedial dark points on and below costa; a slight white discoidal striga; a straight punctiform postmedial dark line slightly defined on outer side by whitish, and punctiform terminal line; a fine whitish line at base of cilia. Hindwing pale tinged with brown; a fine brown line near base of cilia.

Habitat.—CEYLON, Poyahawelle (Alston). *Exp.* 16 mill. Type in B. M.

4425*a*. CRYPTOBLABES SCOTOCHROALIS, n. sp.

♀. Head and thorax dark cupreous brown with a greyish glose; abdomen greyish suffused with brown; pectus, legs and ventral surface of abdomen whitish mixed with fuscous, the fore legs fuscous, the tarsi fuscous with slight pale rings. Forewing dark cupreous brown with a silvery grey glose; antemedial line rather strong, white, oblique from below costa to inner margin towards which it is diffused on inner side; subterminal line slight, whitish, somewhat excurved at middle then oblique; a faint greyish terminal band; cilia greyish. Hindwing greyish tinged with brown especially on the veins; cilia pale brownish with a white line at base.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 14 mill. Type in B. M.

4427*a*. CRYPTOBLABES FLAVIZONALIS, n. sp.

♀. Head and thorax brownish white; palpi black at side; a black-brown band between antennæ; abdomen yellowish with lateral fuscous marks and dorsal black points on basal segments; the terminal segments fuscous with whitish bands; pectus, legs and ventral surface of abdomen white mixed with some fuscous, the tarsi fuscous ringed with white. Forewing white slightly irrorated with black, the inner area suffused with purple-red; obliquely placed subbasal black points below costa and cell; an antemedial olive-yellow band expanding on inner half and defined on each side by black lines overlaid by silvery scales; two black discoidal points; subterminal line white defined on inner side by a red line blackish and angled outwards below costa and on outer by a rather diffused black line overlaid by silvery scales with some red on its outer edge; a terminal series of black points; cilia whitish with brownish lines near base and tips. Hindwing white tinged with brown especially on the veins; the cilia whitish with a faint brownish line near base.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 12 mill. Type in B. M.

EPIPASCHIANÆ.

4538*a*. LEPIDOGMA CHLOROPHILALIS, n. sp. (Pl. G., f. 39.)

♀. Head and thorax green mixed with rufous and a few black scales; palpi black at tips; antennæ blackish except at base; tibiæ and tarsi banded with black; abdomen ochreous tinged with brown and with obscure blackish bands except at base. Forewing sap-green irrorated with black; the terminal half of costa red, the medial area sometimes irrorated with red; subbasal line represented by black points below costa and cell; some

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

black below the cell and on inner margin before the rather diffused oblique waved antemedial line; a discoidal tuft of black scales; postmedial line black defined on outer side by whitish, dentate, excurved from below costa to vein 2; subterminal line represented by a pale green band defined on inner side by dark green or blackish suffusion and on outer by a terminal series of dark green lunules; cilia chequered white and black. Hindwing pale almost wholly suffused with fuscous; a curved minutely waved diffused dark postmedial line defined on outer side by whitish; the termen purplish red with a terminal series of small black lunules; cilia whitish chequered with black from apex to vein 2; the underside whitish suffused with purplish brown, especially on terminal area, a curved dentate dark postmedial line.

Habitat.—Ceylon, Maskeliya, (Pole), Madulsima (Vaughan). *Exp.* 30 mill. Type in B. M.

4438*b*. Lepidogma melanolopha, n. sp.

♀. Head, thorax and abdomen pale reddish brown; palpi black with pale ring at base and extremity of third joint; tibiæ and tarsi black ringed with white. Forewing pale reddish brown sparsely irrorated with black; the costal area suffused with black to the postmedial line, the subbasal and antemedial lines represented by pale bars on it; a prominent tuft of black scales at upper angle of cell; a faint diffused fuscous shade beyond and below the cell; postmedial line black, strongly excurved below vein 6 and slightly incurved below vein 3; a terminal series of black striæ and a fuscous shade on terminal area above tornus; cilia fuscous with a pale line at base. Hindwing pale reddish brown suffused with fuscous; a subterminal black bar at vein 2 defined on outer side by whitish; a blackish terminal line; cilia fuscous with a pale line at base; the underside ochreous whitish irrorated with fuscous especially on costal area, the terminal area tinged with fuscous, a pale postmedial line obliquely curved to submedian fold near termen.

Habitat.—Ceylon, Kegalle (Mackwood). *Exp.* 20 mill. Type in B. M.

4545*b*. Macalla brachyscopalis, n. sp.

Male with the antennal process short and hardly extending behind the head.

♂. Head and thorax olive-green with some black scales; palpi mostly black; antennal process black at tip; tarsi black with pale rings; abdomen olive green with some black scales, tinged with rufous and largely mixed with black towards extremity. Forewing olive-green irrorated with black expecially towards costa, the terminal area slightly ringed with rufous; a pale oblique antemedial striga from costa; a discoidal tuft of black scales; postmedial line blackish defined on outer side by pale olive, oblique from costa to vein 5, excurved to vein 2, then again oblique to near tornus; a terminal series of small triangular black spots; cilia chequered olive and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

blackish, with a fine pale line at base. Hindwing pale silky olive tinged with fuscous especially on terminal area; a terminal series of small triangular black spots; cilia with a fine pale line at base.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 22 mill. Type in B. M.

4446*b*. MACALLA EUMICTALIS, n. sp. (Pl. G., f. 40.)

Head, thorax and abdomen greyish mixed with rufous and black; tarsi black with pale rings. Forewing greyish tinged with olive and in parts with rufous especially on medial area and irrorated with black, the apical area suffused with black; some black suffusion on base of inner margin and on costa before middle; antemedial line represented by a ridge of raised black scales, inwardly oblique from costa to vein 1, then bent outwards above inner margin; a sinuous medial ridge of black scales from cell to nner margin; a discoidal tuft of black scales and a diffused oblique ridge of scales from lower angle of cell to vein 1; postmedial line black, dentate, oblique from costa to vein 4, then erect and angled inwards at vein 2, a whitish patch before it beyond the cell; a terminal series of rather triangular blackish spots with a slight whitish patch before them at middle; cilia chequered rufous and blackish. Hindwing olive tinged with rufous and fuscous; cilia with a fine pale line at base.

Habitat.—CEYLON, Maskeliya (de Mowbray). *Exp.* ♂ 34, ♀ 40 mill.

ENDOTRICHINÆ.

4504*a*. TRICHOPHYSETIS UMBRIFUSALIS, n. sp. (Pl. G., f. 41).

♀. Head, thorax and abdomen white, the last faintly tinged with brown; palpi with some black scales; two black points between antennæ; fore tibiæ, the spurs and tarsi with black points. Forewing white with a faint brownish tinge on inner area except towards base and on terminal area; a black point below base of vein 1; an indistinct double curved brownish antimedial line with black points at costa and submedian fold; an indistinct double curved brownish postmedial line; a minutely waved fuscous line from costa towards apex to termen at vein 3, the area beyond it suffused with brown. Hindwing white, the terminal area tinged with brown; a double brown antemedial line with black spot on its outer edge in submedian fold; a double brown postmedial line with black spot on its inner edge at submedian fold almost touching the antemedial spot, and black point at inner margin; cilia brown; the underside with indistinct double subterminal line from costa to vein 3 with black spot on its inner side at costa.

ab. 1. Abdomen more suffused with brown and irrorated with black; forewing with the inner half from before middle suffused with brown and irrorated with black; hindwing with the inner area from before middle and the terminal area suffused with brown and black.

Habitat.—MADRAS, Nilgiris, Ootacamund (Cardew), Ouchterlong Valley (Andrewes). *Exp.* 22 mill. Type in B. M.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PYRALINÆ.

4546*d*. STEMMATOPHORA ÆDALIS, n. sp.

♀. Head, thorax and abdomen brownish grey irrorated with black; the tarsi with slight pale rings. Forewing grey tinged with brown and thickly irrorated with fuscous; antemedial line white, almost obsolete towards costa, angled outwards on median nervure and oblique towards costa and inner margin; postmedial line whitish, excurved at middle and above inner margin; a fine pale line at base of cilia. Hindwing grey suffused with brown, the inner area slightly tinged with purplish; a slight curved whitish postmedial line; a fine dark terminal line: cilia whitish with dark lines near base and tips; the underside grey tinged with purplish and thickly irrorated with fuscous, a curved white postmedial line defined on inner side by fuscous.

Habitat—MADRAS, Horsleykonda (Campbell). *Exp.* 22 mill.

4610*a*. BOSTRA SARCOSIA, n. sp.

♂. Head and thorax brownish ochreous; palpi blackish at tips; antennæ with the shaft ringed with black towards base; pectus and legs tinged with reddish and with black mixed, the tarsi black with pale rings; abdomen brownish ochreous irrorated with black, the anal tuft with some black, the ventral surface tinged with purplish red towards extremity. Forewing brownish ochreous with a slight flesh-coloured tinge and sparsely irrorated with black; a series of black points on costa; a black discoidal point; postmedial line formed of black scales, excurved to vein 3, then incurved; a terminal series of black striæ; cilia purplish red with black lines near base and tips. Hindwing ochreous irrorated with fuscous; a rather diffused fuscous curved postmedial line; a terminal series of black points: cilia purplish red with black lines near base and tips; the underside with the costal and terminal areas irrorated with black, a black discoidal point.

Habitat—CEYLON, Galgama (Mackwood). *Exp.* 14 mill. Type in B. M.

4611*a*. BOSTRA MESOLEUCALIS, n. sp. (Pl. G., f. 42).

♂. Head and thorax pale olive slightly tinged with rufous and with some blackish scales; legs whitish; abdomen whitish irrorated with black. Forewing pale olive, the medial area white irrorated with black, the terminal area irrorated with black; some diffused purplish red on base of median nervure; an oblique white antemedial line defined on inner side by purplish red suffusion; postmedial line white defined on inner side by diffused purplish red wedge-shaped patches at discal and submedian folds, oblique from the costa to vein 6, excurved to vein 4, then incurved; a blackish terminal line: cilia with a fine white line at base. Hindwing pale olive irrorated with fuscous; a blackish terminal line; cilia with a white line at base.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 20 mill. Type in B. M.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HYDROCAMPINÆ.

4645c. NYMPHULA GRISEALIS, n. sp.

♀. Head and thorax grey tinged with brown; palpi with the 2nd joint fuscous at sides; abdomen reddish brown, the ventral surface grey. Forewing glossy brownish grey, the terminal area suffused with fuscous brown, a diffused brownish discoidal spot. Hindwing pale brownish grey: cilia of both wings with pale line at base followed by a darker line.

Habitat.—CEYLON, Peradeniya (Green). *Exp.* 18 mill. Type in B. M.

4671*a*. OLIGOSTIGMA ANDREUSIALIS, n. sp. (Pl. G. f. 43).

♀. Head and thorax whitish mixed with yellow-brown and fuscous scales; antennæ ringed with black; abdomen yellow mixed with brown and black and with whitish segmental rings. Forewing whitish suffused in parts with yellow and thickly irrorated with black; a double oblique fuscous postmedial line filled in with whitish from costa to vein 3, with fulvous orange suffusion before it, met at vein 3 by an oblique fulvous orange streak from origin of vein 2; a whitish streak from middle of inner margin, bent upwards to submedian fold in which it extends to the terminal band, some fulvous orange above it below origin of vein 2; an orange terminal band defined on inner side by a black line with a white line before it from costa to the whitish streak; cilia brownish white with a fuscous line near base. Hindwing orange, the base whitish with a diffused brown subbasal line; a diffused double brown medial line filled in with white; a white subterminal band defined on inner side by diffused brown and on outer by a black line; some slight black stiræ before the black terminal line forming at apex two spots with a white point between them: cilia brownish white; the underside paler, the subterminal band arising at discal fold.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 18 mill. Type in B. M.

4681*a*. OLIGOSTIGMA CHRYSOZONALIS, n. sp.

♀. Head and thorax ochreous white; abdomen brownish ochreous with white segmental lines, the ventral surface white. Forewing brownish ochreous; a round orange discoidal spot defined by fuscous, a black point above it on costa, an indistinct oblique whitish band from before it to vein 1 and some whitish beyond and below it, an obscure orange streak on medial part of vein 1; postmedial line slight, dark, slightly defined by whitish on outer side, erect from just below costa to vein 2, then bent outwards to inner margin near tornus where it is met by a black line from median nervure just before end of cell, bent outwards below submedian fold, a golden yellow terminal band with fine black line on its inner edge from just below costa to above tornus with a white band before it with dark line on its inner edge; a terminal series of black points. Hindwing white; a fuscous brown band from costa beyond middle to inner margin near base;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a golden yellow terminal band with dark line on its inner edge excurved below costa, then slightly sinuous ; two black terminal lines with some white between them, the inner slight and with some whitish before it at apex and from the lobe to tornus, both interrupted at the lobe on which there are two black points with silvery white points before them : cilia white with slight fuscous line through them and some fuscous at the lobe.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 24 mill. Type in B. M.

4700*a*. DAULIA ARGYROSTROTALIS, n. sp.

♂. Head and tegulæ orange ; palpi brownish at base ; frons brownish with slight white lateral line ; antennæ brownish ; thorax brownish mixed with silvery white ; abdomen white irrorated with brown. Forewing brownish grey irrorated with silvery scales and with obscure orange rufous markings; some orange rufous on basal area, a rather diffused antemedial line, a discoidal lunule and a diffused incurved postmedial band; the terminal area rather yellower with a silvery subterminal band on it. Hindwing brownish grey irrorated with silver ; some orange yellow below and beyond lower angle of cell ; a small dark spot below the angle of cell and another above tornus ; a diffused incurved dark band from costa beyond middle to termen at vein 2 towards which it has some silver markings on it ; a silver terminal band from below apex to vein 2 with some yellow before it, cilia yellow with brown tips from apex to vein 2, then pale.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 26 mill. Type in B. M.

Genus CENOLOBA.

Cenoloba, Wlsm. Ent. Mo. Mag. xxi, p. 175 (1885).

Type *C. obliteralis*, Wlk., from Australia.

Proboscis fully developed ; palpi porrect, typically extending about three times length of head and with the 3rd joint porrect, the 2nd joint fringed with hair below produced to a point at extremity, the 3rd naked ; maxillary palpi about half the length of labial palpi, typically triangularly scaled ; frons rounded ; antennæ minutely serrate and ciliated. Forewing elongate, narrow, the termen deeply cleft to one half, the segments lanceolate ; vein 1 simple ; 2 and 3 stalked ; 4 from angle of cell ; 5, 6 obsolete ; 7 from upper angle ; 8, 9, 10, 11 stalked. Hindwing elongate and gradually dilated, the termen deeply cleft, the segments lanceolate ; vein 2 from before angle of cell ; 3, 4 stalked from angle ; 5 to base of cleft from middle of discocellular ; 6, 7 shortly stalked ; 8 anastomosing with 7 to three-fourths of wing.

4751*d*. CENOLOBA TAPROBANA, n. sp.

Palpi about twice the length of head, the 3rd joint set on at an angle ; maxillary palpi almost filiform.

White ; antennæ yellowish ; tarsi with brownish rings. Forewing with some dark points on costa ; indistinct yellowish antemedial, medial and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

postmedial bands from below costa to inner margin; a slight dark discoidal striga on outer edge of the medial band; the extremity of the lower lobe yellowish. Hindwing with antemedial and postmedial yellowish bands, the extremities of the lobes yellowish.

Habitat.—CEYLON, Trincomali (E. E. Green). *Exp.* 10 mill. Type in B. M.

PYRAUSTINÆ.

4768*a*. MASSEPHA RUFESCENS, n. sp. (Pl. G., f. 44).

Hindwing with veins 4, 5 strongly stalked.

♀. Head, thorax and abdomen dark-brown mixed with yellowish white the frons and head between antennæ paler; palpi yellowish white, the 1st and 2nd joints banded with brown; legs yellowish white tinged with brown. Forewing reddish brown irrorated with dark brown on inner area; the costa and terminal area pale yellow; antemedial patches of diffused black scales below the cell and vein 1; a discoidal whitish patch with a brown striga on discocellulars; an oblique brown postmedial line defined on outer side by a whitish band. Hindwing red-brown, the basal half irrorated with dark-brown and greyish scales; an indistinct oblique dark discoidal spot; an indistinct sinuous brown postmedial line faintly defined on outer side by greyish; the apex pale yellow; the underside whitish, the costal half suffused with brown, a dark spot in cell near base and prominent discoidal lunule, the postmedial line more distinct.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 16 mill. Type in B. M.

4783. REHIMENA PHRYNEALIS.

Larva. Pale grass-green; skin semi-transparent; somites well-defined; dorsal stripe slightly darker green; a few fine black specks on the head and 2nd somite; ventral surface and legs much paler; head ochreous yellow. Feeds spun up in the leaves of a creeper. (W. H. Campbell.)

4850*a*. NOSOPHORA MESOSTICTA, n. sp.

♂. Head and thorax brown, the frons, vertex of head and tegulæ with some whitish; pectus and legs ochreous white with some brown; abdomen brown with white dorsal bar at base, the ventral surface white. Forewing brown; a small white spot in middle of cell and a bar beyond the cell expanding into a rounded patch between veins 4 and 2. Hindwing brown with round white spot beyond the cell.

Habitat.—ASSAM, Khâsis. 1 ♂ type. *Exp.* 28 mill.

4834*a*. BOCCHORIS ALBINALIS, n. sp.

Head and thorax pure white, the patagia with rufous point; fore tibiæ with rufous band at extremity; abdomen white dorsally tinged with rufous. Forewing pure white; a subbasal rufous striga from costa and slight curved mark above inner margin; antemedial line double, rufous, oblique and sinuous; medial line double, rufous, enclosing a rufous discoidal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

striga, the inner line incurved and the outer line excurved below the cell; postmedial line rufous, double towards costa, excurved to vein 3, then incurved; subterminal line rufous, incurved, from costa to vein 3, a rufous terminal line; cilia with a slight rufous line at middle. Hindwing semi-hyaline white; a double rufous medial line arising below costa, obliquely curved and enclosing a white discoidal bar; postmedial line rufous, slightly excurved at vein 5 and ending at vein 2 on the sinuous rufous subterminal band; a rufous terminal line and fine rufous line near base of cilia.

The Muscat specimen has the subterminal line of forewing continued to inner margin and closely approximated to the postmedial line; the postmedial line of hindwing double, the line through the cilia of both wings stronger and the cilia of forewing tinged with rufous at apex and middle.

Habitat.—ARABIA, Muscat (Jayaker); BOMBAY, Kutch (Swinhoe). *Exp.* 18-20 mill. Type in B. M.

4878*a*. PHRYGANODES STYGIALIS, n. sp.

Abdomen of male slightly dilated towards extremity with exsertible dorsal fringe of white hair, the anal segment very long.

♂. Head, thorax and abdomen deep fuscous brown; palpi white at base; pectus, legs and ventral surface of abdomen white, the fore legs fuscous in front, the fore tibiæ and tarsi banded with white. Forewing deep fuscous brown; a minutely waved blackish antemedial line; a small black spot in middle of cell and discoidal lunule; postmedial line black, incurved below costa, bent outwards and minutely dentate between veins 5 and 2, then bent inwards to below end of cell and sinuous to inner margin. Hindwing deep fuscous brown with a slight greyish tinge; postmedial line blackish, oblique and minutely waved from costa to vein 2, then bent inwards and sinuous to inner margin; the underside whitish tinged with brown, a small black discoidal spot, the postmedial line not waved.

Habitat.—CEYLON, Maskeliya (Alston), Haputale (Alston). *Exp.* 30 mill. Type in B. M.

4894*a*. DICHOCROCIS MACROSTIDZA, n. sp.

Head, thorax and abdomen orange-yellow; tegulæ, shoulders and patagia with black spots; fore coxæ and fore and mid femora blackish the fore tibiæ and the tarsi banded with black; abdomen with dorsal and subdorsal series of black spots, the anal tuft of male black. Forewing orange-yellow; a black spot at base of costa; antemedial black spots at costa, below cell and on inner margin; a black spot in middle of cell and discoidal bar; an oblique postmedial maculate band from costa to discal fold and an incurved series of three spots from below lower angle of cell to inner margin; an oblique series of seven spots from below costa towards apex to inner margin and three subterminal spots between veins 3 and 2. Hindwing orange-yellow; a black discoidal spot and two obliquely

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

placed spots above middle of inner margin; three obliquely placed postmedial spots from below costa to discal fold, a series of eight spots from below costa towards apex to above tornus, and three subterminal spots between veins 5 and 2.

Habitat.—BURMA, Rangoon (Scott), Khyen Hills (Watson). *Exp.* 28·32 mill. Type in B. M.

4911*a*. NACOLEIA PACHYTORNALIS, n. sp.

Hindwing of male with groove in submedian fold on upperside, the underside with tuft of long pinkish hair from base of inner margin, the inner area forming a large hollowed out vesicle towards tornus, with small curved tuft of hair at middle of vein 1 and fringes of thick scales towards tornus.

♂. Head ochreous; thorax grey suffused with purplish brown; abdomen brownish ochreous; palpi whitish at base and with brown band at middle; pectus and legs white tinged with ochreous. Forewing grey tinged with purplish and irrorated with brown; traces of a sinuous dark antemedial line; a dark discoidal lunule constructed at middle; postmedial line dark, excurved to vein 4, then bent inwards to lower angle of cell and oblique to inner margin; cilia grey and fuscous with a pale line at base. Hindwing brownish grey irrorated with fuscous except on costal area; an ill-defined whitish antemedial band; a dark postmedial line, excurved to vein 4, then bent inwards to lower angle of cell: cilia fuscous with whitish lines at base and middle; the underside yellowish white with indistinct curved dark postmedial line.

Habitat.—MADRAS, Horsleykonda (Campbell). *Exp.* 20 mill. Type in B. M.

4920*a*. NACOLEIA OCHRIZONALIS, n. sp.

Head brown mixed with ochreous; palpi ochreous with blackish band on second joint; thorax cupreous brown; pectus and legs ochreous, the fore tibiæ with blackish band; abdomen cupreous brown, the extremity and ventral surface ochreous. Forewing cupreous brown, the costa except towards base and the termen and cilia ochreous; antemedial line rather diffused, oblique from costa to median nervure; a black point in middle of cell and small discoidal lunule; postmedial line rather diffused, blackish, at vein 4 bent inwards to below angle of cell, then erect. Hindwing cupreous brown, the termen and cilia ochreous; a blackish discoidal striga; postmedial line indistinct, blackish, slightly bent outwards between veins 5 and 2, then bent inwards and oblique to above tornus.

Habitat.—SIKHIM (Pilcher); ASSAM, Khásis. *Exp.* 30 mill. Type in B. M.

4928*a*. NACOLEIA FUSCIFUSALIS, n. sp.

Head, thorax and abdomen fulvous yellow mixed with fuscous; palpi black, white at base; pectus, legs and ventral surface of abdomen white,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the fore tibiæ with fuscous band. Forewing fulvous yellow irrorated and suffused with fuscous especially on basal area and terminal area except above tornus; antemedial line blackish, bent outwards at median nervure, a small annulus in middle of cell and discoidal lunule defined by blackish; terminal half of costa with short black streaks; postmedial line black, incurved at discal fold, excurved between veins 5 and 2, then retracted to below end of cell and again excurved above inner margin, a blackish patch beyond it above inner margin and the terminal area blackish from apex to vein 3; a terminal series of small black spots; cilia yellow with a black line near base and some fuscous at middle. Hindwing fulvous yellow, the terminal area suffused and irrorated with blackish except a patch below middle; some black at extreme base and a black discoidal spot; postmedial line black, excurved between veins 5 and 2, then retracted to below the discoidal spot and straight to inner margin; a series of black points just before termen: cilia yellow with some fuscous at middle; the underside with the blackish on terminal area confined to apical area.

Habitat.—CEYLON, Rambukkhana (Alston); WOODLARK I. (Meek). *Exp.* 14 mill. Type in B. M.

4928*b*. NACOLEIA LEUCOSEMALIS, n. sp.

♂. Head, thorax and abdomen pale yellow mixed with black except on terminal half of abdomen which has a black bar at base of anal segment and lateral series of black points; antennæ ringed with black; pectus, legs and ventral surface of abdomen whitish, the fore tibiæ with blackish band. Forewing yellow thickly irrorated with black, the costa and termen less thickly irrorated; a subbasal black striga from costa; antemedial line black, waved; a white spot in middle of cell and narrow discoidal lunule defined by black; postmedial line blackish with black spot at costa, excurved between veins 5 and 2, then retracted to below the discoidal lunule and straigth to inner margin; a terminal black line from apex to vein 3. Hindwing yellow thickly irrorated with black except at termen; a small black discoidal spot, sinuous blackish postmedial line, and slight blackish terminal line from apex to vein 3; the underside with the postmedial line excurved between veins 5 and 2.

Habitat.—CEYLON, N. Centr. Province (Pole). *Exp.* 12 mill. Type in B. M.

4942*b*. NACOLEIO CONISOTA, n. sp.

♀. Head, thorax and abdomen pale reddish brown, the head and front of thorax tinged with black; palpi white at base; pectus, legs and ventral surface of abdomen pale. Forewing ochreous suffused with reddish brown and irrorated with fuscous, the basal half of costal area blackish; antemedial line dark, excurved in submedian interspace; a black point in middle of cell and two discoidal bars; some black points on medial part of costa; postmedial line black, excurved between veins 5 and 2, then retracted to below end of cell and excurved above inner margin; a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

terminal series of blackish points. Hindwing ochreous tinged with red-brown and irrorated with fuscous; a small blackish discoidal spot; post-medial line blackish, excurved between veins 5 and 2, then retracted to below end of cell and oblique to tornus; a terminal series of blackish points.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 22 mill. Type in B. M.

4942c. NACOLEIA MEGASPILALIS, n. sp.

Head and thorax cupreous brown mixed with white; abdomen banded white and cupreous brown. Forewing whitish; the basal area suffused with cupreous brown; an oblique, slightly irregular dark antemedial line; a quadrate cupreous brown spot in middle of cell conjoined to another below the cell; a equadrate cupreous brown patch in and beyond end of cell with small spot above it on costa and another beyond it on costa; postmedial line rather diffused and maculate, oblique from costa to vein 5, bent outwards and somewhat dentate between veins 5 and 2, then retracted to below angle of cell; terminal area suffused with brown and with a white patch between veins 5 and 2 leaving two small wedge-shaped brown spots on termen. Hindwing white; a diffused brown line close to base; a discoidal point; a diffused rather maculate medial line; a diffused rather maculate postmedial line bent outwards and somewhat dentate between veins 5 and 2; teminal area suffused with brown and with white patch between veins 5 and 2 leaving two small wedge-shaped brown spots on termen.

Habitat.—MADRAS, Horsleykonda (Campbell); QUEENSLAND, Dawson Dist. Ranöe (Barnard). *Exp.* 20 mill. Type in B. M.

4983a. SYLEPTA AGRAPHALIS, n. sp.

Sylepta denticulata, Hmpsn. Moths Ind. iv., p. 338 (part).

♂. Head, thorax and abdomen grey-brown, the head whiter; palpi black, white at base and tips; pectus, legs and ventral surface of abdomen whitish. Forewing grey-brown; a slight dark antemedial mark on costa and oblique whitish line defined on outer side by fuscous from cell to inner margin; a small whitish spot at middle of cell and curved discoidal striga both defined by fuscous; postmedial line represented by a small fuscous spot at costa with two small whitish spots below it, then by a series of small fuscous spots with whitish points on their outer side, excurved between veins 5 and 2, then bent inwards to below end of cell and oblique to inner margin; a terminal series of minute blackish points and a fine pale line at base of cilia followed by a dark line. Hindwing grey-brown; an oblique dark discoidal striga; a slight dark postmedial line defined on outer side by whitish, bent outwards between veins 5 and 2, then retracted and oblique to above tornus; a terminal series of blackish striæ and fine pale line at base of cilia.

Habitat.—BHUTAN (Dudgeon); ASSAM, Khásis. *Exp.* 32 mill. Type in B. M.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

4989*a*.—SYLEPTA MICROSEMA, n. sp.

♂. Head and thorax dull greyish brown; palpi fuscous, white at base, bdomen pale brown; pectus, legs and ventral surface of abdomen white, the fore tibiæ with slight fuscous band. Forewing brown with a slight cupreous tinge; antemedial line indistinct, dark, oblique, from costa to median nervure, then more erect; a pale point in middle of cell and slight whitish discoidal lunule both defined by dark-brown; postmedial line dark-brown, slightly incurved below costa and oblique to vein 2, then retracted to below end of cell and excurved at vein 1. Hindwing brown with a slight cupreous gloss; a faint dark discoidal bar; postmedial line very indistinct, dark, slightly excurved between veins 5 and 2, then retracted to below end of cell and oblique to above tornus; the underside brownish white.

Habitat.—CEYLON, Puttalam (Pole); SINGAPORE (Ridley); LOUISIADES, St. Aignan (Meek). *Exp.* 28 mill. Type in B. M.

4990. SYLEPTA ADDUCTALIS.

Larva.—Attenuated at extremities, the divisions of somites strongly marked, dull pinkish green; head small, dull green. Feeds spun up in the leaves of *Balsam*. (W. H. Campbell.)

4994. SYLEPTA PSEUDOVIALIS, n. sp.

Sylepta ovialis, Hmpsn. Moths Ind. iv, p. 340 (nec. Wlk.)

Head, thorax and abdomen fuscous brown with a slight cupreous gloss; palpi black-brown, white at base; pectus, legs and ventral surface of abdomen white, the fore tibiæ with fuscous band at extremity and the tarsi tinged with fuscous above. Forewing fuscous brown with a slight cupreous gloss; traces of a whitish antemedial line from cell to inner margin with a more or less distinct spot beyond it in cell; a quadrate white spot in end of cell; postmedial line forming an eliptical white spot from below costa to vein 5 where it is very slightly bent outwards, then slight, whitish, at vein 2 bent inwards to below end of cell, then more distinct and slightly excurved. Hindwing fuscous brown with a cupreous gloss; a faint dark discoidal lunule; postmedial line with small white spot below costa, then slight, whitish and bent outwards between veins 5 and 2, then bent inwards to below end of cell and more distinct and oblique to above tornus; cilia with a fine white line at base; the underside with the basal and inner areas whitish, a dark point in middle of cell and discoidal lunule, the postmedial line more distinct.

Habitat.—SIKHIM (Dudgeon, Pilcher); BHUTAN (Dudgeon); ASSAM, Khásis; CEYLON (Green); BORNEO, Sarawak (Shelford), Pulo Laut (Doherty). *Exp.* 30 mill. Type in B. M.

5008*a*. GLYPHODES CAPRINIODES, n. sp.

Head, tegulæ and shoulders fulvous brown, the rest of thorax white; palpi white at base and in front; pectus, legs and abdomen white; the fore tibiæ fulvous. Forewing semihyaline white, the costal area fulvous

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

brown indented by a slight white striga at discocellulars; a series of fuscous striæ just before termen. Hindwing semihyaline white with a fine fuscous line just before termen.

Habitat.—PUNJAB, Manpuri; BOMBAY, Ratnagiri (Jayaker); BURMA, Tenasserim, Donaut Hills, (De Nicéville); ANDAMANS. *Exp.* 36-40 mill. Type in B. M.

5010*a*. GLYPHODES ATHYSANOTA, n. sp.

♂. Yellow-green; palpi fulvous, white at base, and at tips of maxillary palpi; frons fulvous and white at sides; antennæ with the tuft before the excision yellow at tip; shoulders with fulvous streaks; pectus and ventral surface of abdomen white; the fore tibiæ banded with fulvous, the mid tibiæ streaked with fulvous above at base; anal tuft fuscous and white. Forewing with the costa reddish brown; a black discoidal point; cilia reddish brown, white at tips. Hindwing with the costal and inner areas white; cilia red-brown, white at tips from apex to vein 2, then wholly white.

Habitat.—MADRAS, Nilgiris (Andrewes); BR. N. GUINEA, Mafalu (Pratt), McKebea (Pratt). *Exp.* 30 mill. Type in B. M.

5184*b*. NOORDA MARGARONIALIS, n. sp.

♂. Head, thorax and abdomen pale yellow-green; palpi at tips and lower part of frons white; pectus and legs white; anal tuft fuscous. Forewing pale yellow-green, the costal edge white; cilia white at tips. Hindwing semihyaline white tinged with green; the underside with the costal area green.

Habitat.—PUNJAB, Kangra Valley, 4,500 feet (Dudgeon) 1 ♂. *Exp.* 20 mill. Type in B. M.

5196*b*. CALAMOCHROUS BIPUNCTALIS, n. sp.

♂. Head, thorax and abdomen pale ochreous yellow mixed with whitish; palpi white at base, brownish at tips; fore femora and tibiæ tinged with brown. Forewing pale ochreous yellow, the costal and inner areas tinged with brown; two obliquely placed blackish points in middle of cell; an oblique dark antemedial striga from vein 1 to inner margin; a diffused brownish discoidal lunule; the median nervure and base of veins arising from it slightly streaked with brown; a diffused brown mark beyond the cell with oblique fascia from it to apex; short dark postmedial streaks in the interspaces from vein 6 to below vein 2. Hindwing pale ochreous yellow.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 34 mill. Type in B. M.

5236*b*. PYRAUSTA METASIALIS, n. sp.

♂. Head, thorax and abdomen ochreous white irrorated with fuscous; palpi below, pectus and legs whitish, the fore tibiæ with black band at extremity. Forewing ochreous white thickly irrorated with fuscous; the costal edge blackish towards base; a curved blackish antemedial line;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

an obscure blackish annulus in middle of cell and discoidal lunule defined by blackish; postmedial line blackish, oblique to discal fold, bent outwards between veins 4 and 2, then retracted to below end of cell and erect to inner margin. Hindwing ochreous white thickly irrorated with fuscous; a rather diffused oblique blackish antemedial line; postmedial line blackish, incurved at discal fold, then excurved and diffused to tornus; some fuscous suffusion before termen towards apex.

Habitat.—SIKHIM (F. Möller). *Exp.* 14 mill. Type in B. M.

5255*b*. PYRAUSTA MICRODONTALIS, n. sp.

Head, thorax and abdomen white faintly tinged with reddish brown, the head and base of tegulæ rather more strongly tinged; palpi white below and blackish above; abdomen with subdorsal black points on 3rd segment; fore tibiæ with black band at extremity. Forewing white tinged with reddish brown and slightly irrorated with fuscous; antemedial line blackish, oblique from costa to submedian fold; black points at middle of cell and on discocellulars; postmedial line formed of small dentate black marks, excurved between veins 5 and 2, then bent inwards; a terminal series of slight blackish striæ. Hindwing white tinged with reddish brown and slightly irrorated with fuscous; a black discoidal point; postmedial line black, minutely dentate, bent outwards between veins 5 and 2; a terminal series of slight black striæ.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 40 mill. Type in B. M.

5259*a*. PYRAUSTA MONOSEMA, n. sp.

Head, thorax and abdomen red-brown; pectus, femora and ventral surface of abdomen fuscous; antennæ tinged with fuscous. Forewing red-brown; a blackish discoidal bar; postmedial line blackish, bent outwards at vein 6, then minutely waved, excurved to vein 4, then oblique. Hindwing pale reddish brown; the underside with indistinct curved postmedial line.

Habitat.—PUNJAB, Lahore. (Mrs. Mulvany). *Exp.* 28 mill. Type in B. M.

ADDENDA.

SPHINGIDÆ.

91*f*. MARUMBA BENGALENSIS, n. sp.

♂. Head, thorax and abdomen pale red-brown tinged with grey, the dorsum of thorax with darker stripe; frons dark red-brown at sides. Forewing pale red-brown tinged with grey; an oblique slightly incurved antemedial line; two medial lines; some dark suffusion on inner medial area; a pale elliptical discoidal spot defined by fuscous and extending to well below the cell; a dark line just beyond the cell, oblique below vein 4; postmedial line dark, incurved to below vein 4 where it is hooked, then strongly retracted and incurved; a large chocolate brown patch on terminal area from costa to below vein 4, with incurved inner edge

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and two conjoined obliquely placed spots from below vein 3 to tornus. Hindwing ochreous tinged with rufous; a lunulate chocolate-brown patch before termen from vein 3 to tornus ; the underside with two red-brown antemedial lines and two postmedial lines oblique from costa to between veins 3 and 4, then incurved.

Habitat.—BENGAL, Chota Nagpur, Kalunga. *Exp.* 60 mill. Type in B. M.

NOTODONTIDÆ.

221*c*. PHALERA DIVERSA, n. sp.

Antennæ of male bipectinate to two-thirds length.

♂. Head and thorax dark-brown mixed with grey especially on patagia and metathorax ; abdomen dark-brown, the ventral surface with grey mixed. Forewing dark-brown with grey mixed; an oblique sinuous black subbasal line and erect sinuous medial line ; a narrow white discoidal lunule ; some white irroration on postmedial part of costa ; postmedial line black, arising below costa, sinuous, incurved below the cell where there is some brownish grey before it and bent outwards between veins 4, 3 ; a dentate blackish subterminal line arising from apex towards which it is oblique and diffused, incurved between veins 6 and 4, where there is a brownish grey patch beyond it followed by slight black streaks on the veins, then indistinct, dentate and slightly defined on outer side by brownish grey ; a crenulate blackish terminal line. Hindwing dark reddish brown, the cilia whitish at tips ; the underside with rather diffused postmedial line and the terminal area slightly irrorated with grey.

♀. Forewing suffused with pure white to postmedial line except on inner area, some white on terminal area below apex.

Habitat.—BOMBAY, Kanara, Karwar. *Exp.* ♂ 56, ♀ 76 mill. Type in B. M.

265*a*. STAUROPUS CHLOROTRICHA, n. sp.

♂. Head and thorax dark-brown mixed with grey-white ; palpi black-brown, whitish in front ; pectus and legs whitish tinged with red-brown, the tarsi ringed with red-brown ; abdomen dark-brown, the basal crests with a few whitish scales, the ventral surface whitish suffused with red-brown. Forewing dark reddish brown overlaid with golden-green hair-like scales ; faint braces of waved dark antemedial, postmedial and subterminal lines. Hindwing dark red-brown, the apical part of costal area overlaid with golden-green hair-like scales and with a paler green bar just before apex ; the underside white faintly tinged with red-brown.

Habitat.—SIKHIM (F. Möller). *Exp.* 44 mill. Type in B. M.

DREPANIDÆ.

706*a*. LEUCODREPANA FURVICOSTA, n. sp.

Head, thorax and abdomen pure white ; palpi, frons and antennæ

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fulvous; forelegs brownish in front. Forewing pure white, the costal edge fulvous; traces of two oblique waved lines formed of blackish scales from below middle of costa to inner margin and of two similar subterminal lines, and of a line just before termen. Hindwing pure white with traces of a waved antemedial line formed of dark scales, of two similar postmedial lines, and of a line just before termen.

Habitat.—SIKHIM TIBET, Yatung (Hobson); SIKHIM (F. Möller). *Exp.* 30 mill. Type in B. M.

720*a*. DREPANA BICOSTATA, n. sp.

♂. Head blackish; thorax pale violacious brown; pectus and legs greyish ochreous, the forelegs tinged with brown; abdomen greyish, the ventral surface ochreous white. Forewing pale violaceous brown; antemedial and postmedial red-brown patches on costa, the former with slightly incurved fulvous line from it to inner margin; an oblique fulvous subterminal line; the costal area towards apex, the termen and cilia to vein 3 suffused with red-brown. Hindwing ochreous yellow, the inner area greyish with a fulvous postmedial bar; the underside with some greyish on costal area beyond middle and a slight postmedial bar.

Habitat.—SIKHIM (F. Möller). *Exp.* 28 mill. Type in B. M.

(*To be continued.*)

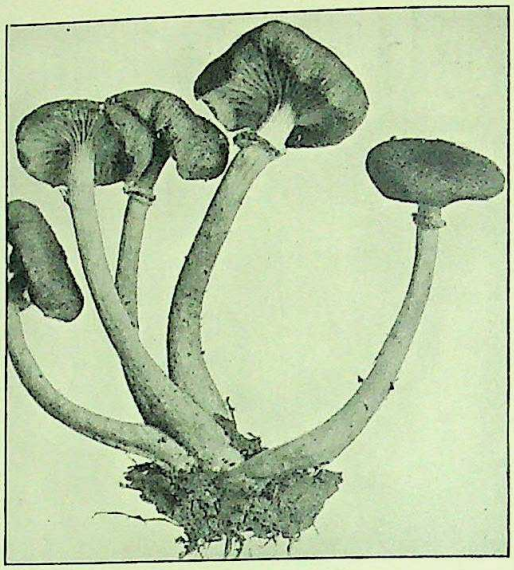
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

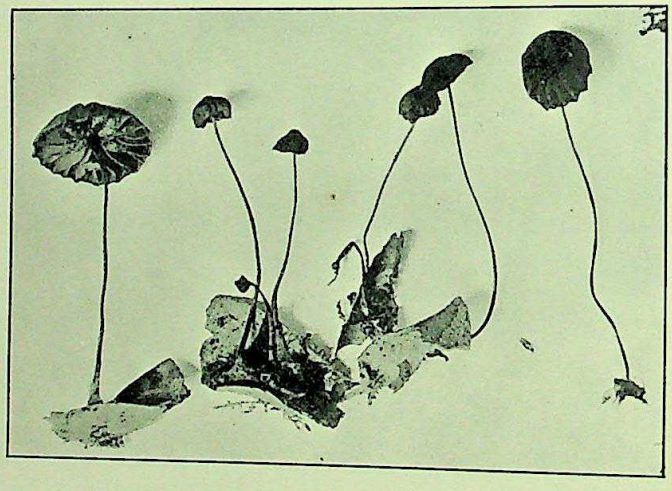
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

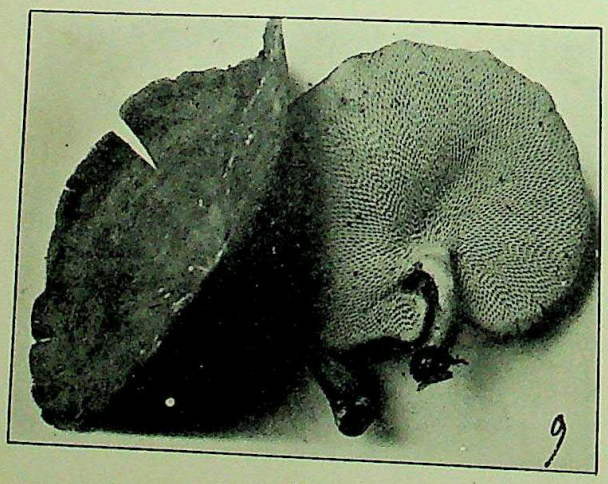
A



B



C



D

A.—*Russula Theissenii.*

B.—*Armillaria mellea.*

C.—*Marasmius subrhodocephalus.*

D.—*Favolus ciliaris.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE FUNGI OF INDIA

BY

F. THEISSEN, S. J.

PART I.

(*With Plates I to IV and text figures* 1 *to* 10.)

The fungal flora of India, especially of the Bombay Presidency, has received very little attention up to now. Whilst collections on a larger scale were made in Ceylon, Australia, and New Zealand, we possess, with regard to the Indian mycoflora, but short notices which appeared at great intervals in the scientific journals of the last forty years. It was only during the last ten years that larger collections were made by Mr. W. Gollan, the Superintendent of the Royal Botanic Gardens at Saharanpur, the Rev. E. Blatter, Professor of Botany at St. Xavier's College in Bombay, and quite recently by the Imperial Mycologist, Mr. E. J. Butler, whose extensive materials have been described by Messrs. H. and P. Sydow in the Annales Mycologici of 1906, 1907 and 1911.

It is not difficult to understand, why the Indian mycoflora has been so much neglected in the past. As it happens very rarely that scientific expeditions, composed of specialists, select India as the field of their explorations, mycologists in Europe have to depend entirely on the good-will and the initiative of amateurs. Much has already been done in this respect by Europeans residing in India, but we feel convinced that many more would be willing to contribute towards the exploration of that vast and interesting country, if they knew how to gather and prepare specimens. We trust, therefore, that a few practical hints for collectors will be welcome.

As to the literature on Indian fungi, we refer to the 'Bibliography of the Botany of British India and Ceylon' by E. Blatter, which appeared in Vol. XX, No. 5 of this Journal, p. lxxix—clxxxv.

I

A FEW HINTS FOR COLLECTORS.

1. How to distinguish fungi.

Fungi may easily be distinguished from other cryptogamic

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

plants, such as lichens and algæ, by the absence of the green colouring matter, called chlorophyll. It is for this reason that they assume all possible colours, except green. Being devoid of chlorophyll they cannot assimilate carbon dioxide, but must take up their carbonaceous food in the form of rather complex compounds, which they find on living or dead organic substances *v. g.* leaves, wood, dung, humus, decayed fruits, paper, insects, etc. Accordingly, some are parasitic, such as the Rusts and Smuts, and absorb those complex carbon-compounds from other living organisms, whether plants or animals. Others are saprophytic, absorbing those compounds from the remains of dead organisms as, *v. g.* the numerous and often large mushrooms which grow on humus or leaf soil in forests,—or from organic substance formed by living organisms. Examples of the latter are the Yeasts and Moulds which make their appearance on juicy fruits, saccharine liquids, etc.

This is not the place to give a systematic account of the different classes of fungi. We shall confine ourselves to giving the general characteristics of some more important groups.

Excluding from the outset the Schizomycetes (*v. g.*, Bacilli), Myxomycetes and Phycomycetes, we shall consider the fungi known as Mushrooms, Toadstools, Puffballs, Yeast, Moulds, Mildews, Rusts and Smuts.

These may be divided into two classes, the Basidiomycetes and Ascomycetes. In the Basidiomycetes the spores are borne free on so-called basidia (Fig. 1), whilst in the Ascomycetes the spores,

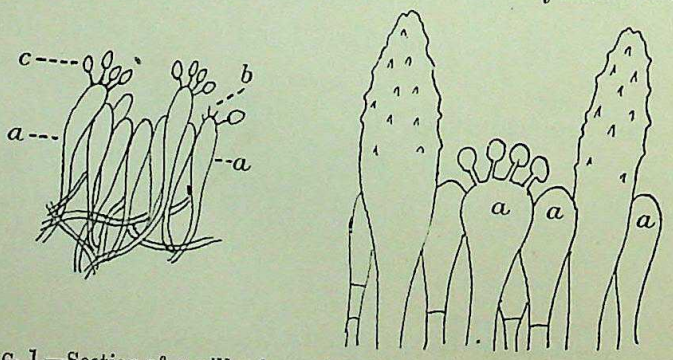


FIG. 1.—Section of a gill of an Agaric (left) and of a pore of a Polyporus (right), showing the basidia (a) which bear on 4 sterigmas (b) the 4 spores (c).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

usually 8 in number, are included in a sack, called ascus (Fig. 2).

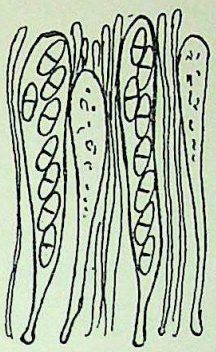


FIG. 2.—Section of the hymenium of an Ascomyces, showing the asci with 8 bicellular spores.

A.—BASIDIOMYCETES.

Omitting for a moment the Uredinales (Rusts, Smuts), we divide the Basidiomycetes into two very natural orders; the Hymenomycetes and Gastromycetes.

In the Hymenomycetes (*v. g.*, the common Mushroom) the basidia with the spores are exposed and free from the beginning, or at least from a very early state. In the Gastromycetes the basidia are developed in cavities within the tissue of the plant (Puff-Balls for instance).

Hand in hand with this internal anatomical structure, the various families show distinct outer morphological characters. In order to distinguish them it is, therefore, not necessary, to make a minute microscopical examination.

I.—Hymenomycetes.

1. **Agaricaceæ.**—Agarics, the common Mushroom. (Plate I, A, B, C).*

---

* Figures A, B, D of Pl. I, A of Pl. III, from Rick. Contributio ad Monogr. Agar. et Polyp. Broteria, 1907.

Fig. C of Pl. I. Theissen, Marasmii austro-brasilienses, Broteria, 1909.

,, of Pl. II. ,, Polyporaceæ austro-brasilienses, Denkschr. Acad. Wien, 1911.

,, B of Pl. III. Lloyd, Hexagona.

,, A, D of Pl. V and A of Pl. VI. Lloyd, Phalloids.

[*See over*]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Usually fleshy, somewhat umbrella-shaped, when stalked, or fan-shaped when sessile. Consists generally of a stalk, termed the stipe, bearing at its apex a large circular expansion, the pileus (hat). On the underside of the pileus are a number of radiating plates of tissue (lamellæ) on which are developed the microscopic basidia. Pileus and stalk vary much as regards size, shape, consistency and colour.

Habitat.—On the ground, amongst moss, on trunks, rotten wood, dead leaves.

Collectors ought to take notes regarding the following points :—Whether the pileus is furrowed or even, viscid or dry, convex or plane, umbonate in the centre or depressed, pubescent or scaly or smooth, ciliated on the margin, of what colour and size ; whether the stalk is viscid, hairy, striped ; colour of the lamellæ.

2. **Polyporaceæ.**—(poly=many, porus=pore, hole). The Dry Rot of timber is caused by members of this family. (Plate I, D ; Plate II ; Plate III, A, B ; Plate IV, A.)

Plants of all possible shapes ; fleshy, cartilaginous, or tough like wood, forming thin crusts, shapeless lumps, or umbrella-shaped like Agarics, or with the stalk-less pileus reflexed. They differ, however, from the Agarics by bearing the basidia not on radiating lamellæ, but in alveolar (honey-comb-like) pits or tubes.

Habitat.—On rotten wood, branches, stumps (seldom on living trees), or on the ground.

Characters to be noted.—Colour of pileus and tubes ; surface even or striped.

---

* (*contd.*)

Fig. 3 and D of Pl. VI. Grevillea, I.
,, B, C of Pl. VI. Durand, Geoglossaceæ, Ann. Mycol., 1908.
,, 7 and C of Pl. VII. Theissen, Fragm. brasil. Ann. Mycol., 1909.
,, A of Pl. VIII. Theissen, Hypocreaceæ bras., Ann. Mycol., 1911.
,, A, B of Pl. VII. Starbäck, Ascom. R. Exped.
,, C of Pl. VIII and Pl. IX. Theissen, Xylariaceæ bras., Denkschr. Acad. Wien, 1910.
,, 6, 9, 10. After Spegazzini, Mycet. Arg. IV.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

3. **Hydnaceæ.**—Like the preceding, but more rarely stalked, usually resupinate (expanded) or forming a reflexed pileus. Basidia on spinous projections or teeth, which cover the under surface of the pileus, or the upper when the fungus is resupinate (Plate IV, B).

Habitat, etc., as in No. 2.

4. **Clavariaceæ** (clava=club).—In this family the special organs for the support of the basidia (like lamellæ, tubes, teeth) disappear. The basidia cover the whole surface or are limited to the upper part. The fungus is either unbranched, forming simple club-shaped bodies, or densely branched, cylindrical, or flattened and expanded, but not differentiated into stalk and pileus, cartilaginous. (Plate IV, C.)

Habitat.—On the ground or on bark.

Characters to be noted.—Colour, pubescence.

5. **Telephoraceæ.**—Light yellow, reddish or brown crusts, ear-shaped pileus, seldom stalked. Basidia equally distributed over the even smooth light-coloured surface.

Habitat.—On wood.

Characters to be noted.—Colour.

II.—Gastromyceles.

In characterizing the families of this order we follow C. G. Lloyd's excellent monograph.

1. **Phalloideæ.**—(Plate V, A, B, C.)

Plants fleshy, enclosed in a gelatinous volva when young (eggs); when mature, they bear at the top a mucilaginous mass which contains the spores.

Phalloids are known for their fœtid smell and bizarre shape. They attract the attention of the most unobserving, and are often given very appropriate names like: Stinkhorn, Stinkballs, Dead Man's Finger.

Only three colours have been observed in Phalloids: red, yellow,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and white. Most of them are red or some shade of red, pink flesh-coloured, orange.

2. **Nidulariaceæ**.—Nest Fungi, Bird's Nests. (Plate VI, A.)

Plants shaped like little cups which open at the top and contain a number of small seed-like bodies, "eggs" (sporangia).

3. **Lycoperdaceæ**.—Puff-Balls.

The ripe peridium consists of two distinct membranes (exoperidium and endoperidium), enclosing a powdery mass (spores).

(*a*) *Geastræ*. Star Puff-Ball.—(Fig. 3).—Outer membrane thick, splitting into recurving segments.

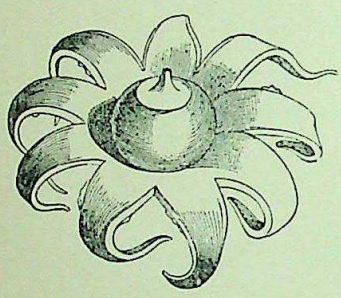


Fig. 3.—Geaster saccatus.

(*b*) *Bovistae*. Tumblers.—Outer membrane thin, not splitting into radiating segments.

(*c*) *Lycoperdæ*. True Puff-Balls.—(Plate V, D.)—Peridium flaccid, opening by a definite mouth, or rupturing irregularly and falling away in pieces.

III.—Uredinales.

This order comprises those parasites which are generally known as Rusts, on account of the rusty appearance they give to their host-plants at a certain stage of their development.

They may be distinguished with the naked eye as minute roundish or oblong brown (yellowish or black) spots ('sori') on the leaves, or even as compact bullate pustules some mm in diameter, scattered or crowded, often hidden by the pubescence of the leaf. The surrounding tissue is often killed by the parasite, assuming the appearance of round reddish-brown or pale spots.

B.—Ascomycetes.

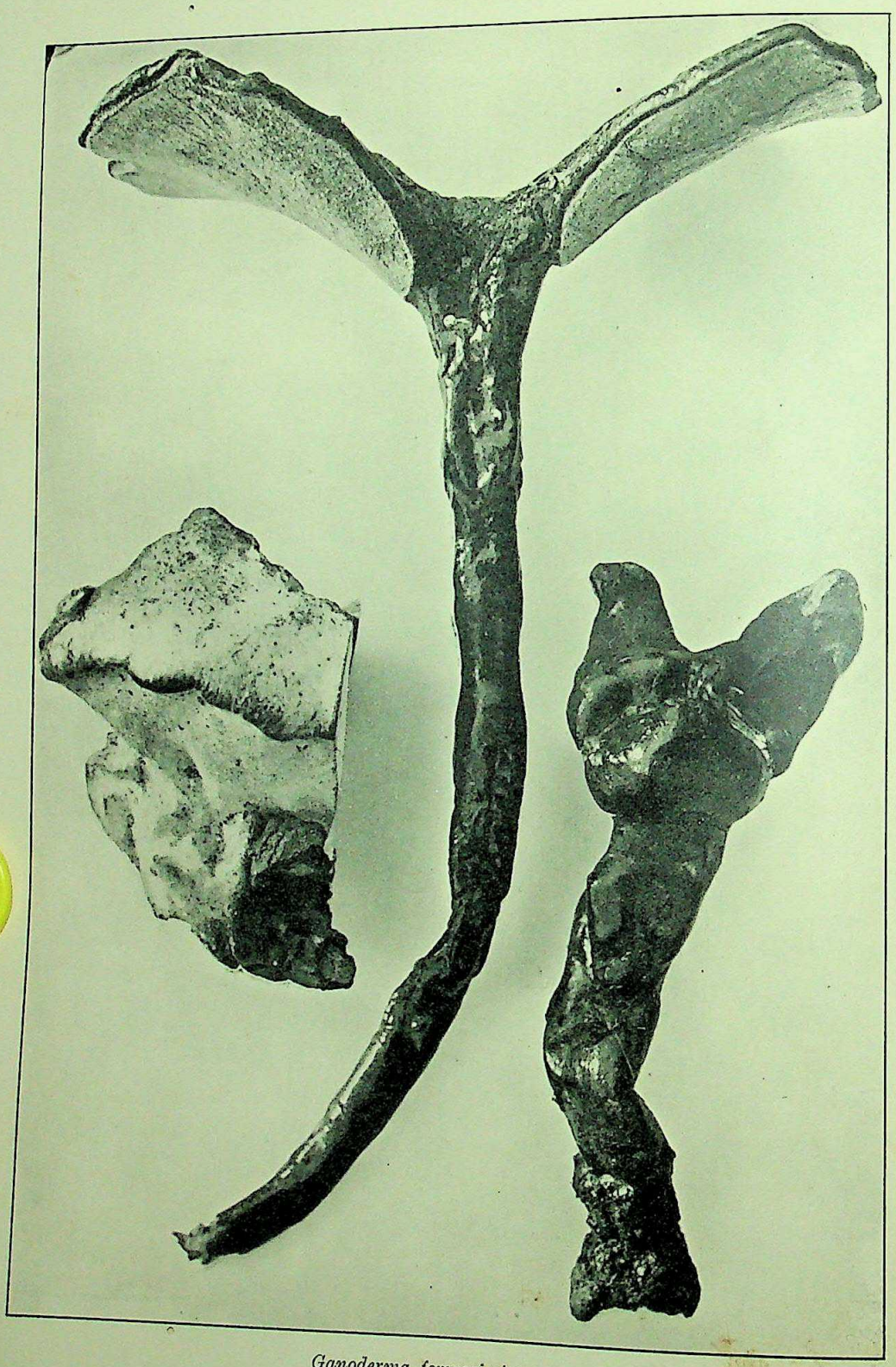
This class includes a vast number of forms. We shall mention only a few typical representatives of the chief families. Some of them, the Discomycetes, have the 'asci' (spore-sacks) disposed on a continuous plain or disc, whilst others, the Pyrenomycetes, have them enclosed in capsules or receptacles, called 'perithecia.'

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Ganoderma formosissimum.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I.—Discomycetes. (Plate VI, B, C, D and fig. 4.)

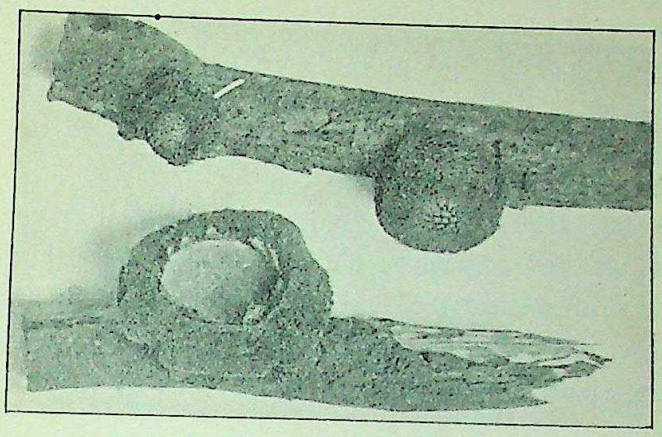


FIG. 4.—Sarcosoma Mœlleri.

Light-coloured small cups or bowls from 1 mm to several cm in diameter, or upright ears, or finally with a distinct stalk. The asci with the spores are not included in receptacles, but distributed over the whole fertile, mostly coloured surface.

In the family Geoglossaceæ this surface does not present the usual cup-shaped form, but reminds one of the club-shaped body of Xylarias.

Characters to be noted.—Colour, dimensions, pubescence.

II.—Pyrenomycetes.

1. **Perisporiales and Microthyriales.** (Fig. 5, 6 and Plate VII, A.)

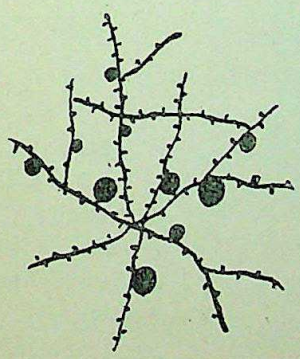


FIG. 5.—Single threads and young perithecia of an Asterina (enlarged).

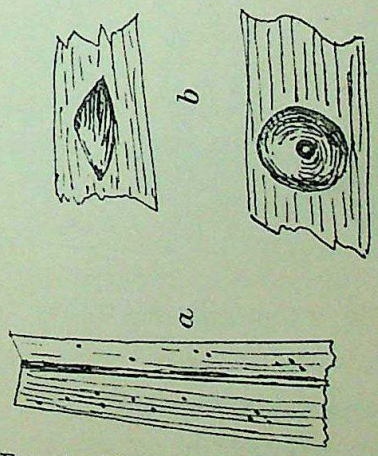


FIG. 6.—Vizella Urvilleana.
a. natural size.
b. two perithecia enlarged.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A very interesting group, mostly leaf-fungi, growing on living and fading leaves of phanerogamic plants. The minute receptacles would escape the eye of the fungus-hunter, if they were not, as is usually the case, crowded together in a black araneous spot of densely interwoven threads.

2. **Hypocreales.**

The representatives of this family appear in all shapes of the Sphæriales (*vide* No. 4 below): clubs, pustules, diffuse thin crusts, and isolated minute scattered perithecia; but they differ by the light-coloured (white, yellowish, reddish), soft (almost fleshy) bodies, the perithecia appearing on the surface as crowded dark minute points.

The most striking species are those growing on insects and their larvæ and chrysalids. (Plate VIII, A.)

3. **Dothideales.** (Plate VII, B.)

Mostly leaf-fungi, forming shining carbonaceous circles or stripes. On branches, they produce pustulate rough black tumours, which are easily recognized.

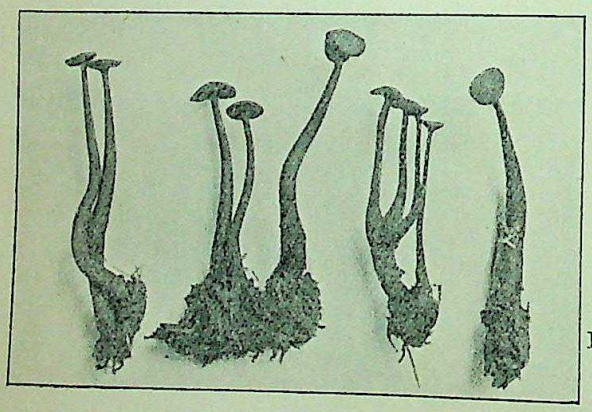


Fig 7.—Poronia oedipus.

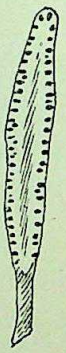


Fig. 8.—Section of the club of a Xylaria showing the small dark receptacles (perithecia).

4. **Sphæriales.**

The most common forms are the following:—

(a) Receptacles (perithecia) crowded and immersed in a compact, solid carbonaceous vegetative 'stroma', black

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on the outer side, forming club-shaped bodies, bullate pustules, or dark flat crusts. (Plate VII, C, VIII, B, C, IX and fig. 7 and 8.)

(*b*) Receptacles single or scattered, minute, superficial, and attracting the attention only when closely grouped together, or immersed in the bark, piercing the epidermis with their tips. (Fig. 9 and 10.)

In this case their presence may be noticed by dark punctiform holes in the epidermis or by the removal of the epidermis, when the black deformation produced in the cambium will at once be apparent.

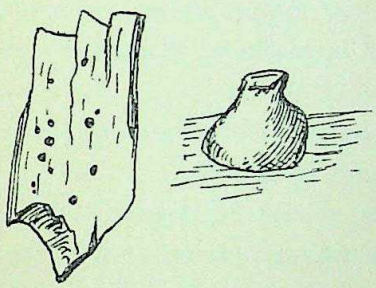


FIG. 9.—Lophiostigma xerophilum.

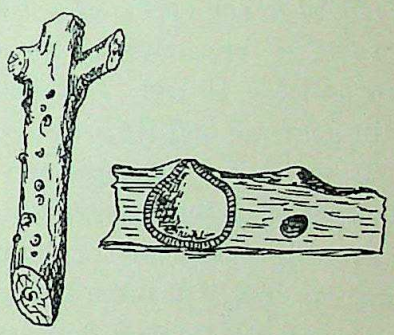


FIG. 10.—Oraniella coffeicola; natural size (left) and section (right; enlarged).

2. *How to gather and preserve fungi.*

GENERAL.

1. Take your notes from fresh specimens, before the fungus begins to shrivel up. As to what notes are required, see above.

2. Add the name of the locality, and of the collector, the date (rainy season or not, etc.); mention the substratum of the fungus, whether branches, stumps, leaves, ground. As to the leaf-fungi it is almost indispensable to know the host-plant.

3. Pick up as ample material as possible. There will be more chances in this case, that your material will contain not only half-developed or abnormal specimens without fructification, but also ripe and typical ones. As the various stages of development are of interest to the specialist, it will be good to gather young and old specimens.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

4. Do not break or cut off the fungus, but dig or cut it out along with its substratum. This will enable mycologists to study the method of insertion.

5. Specimens of different localities or hosts should be kept separately, even if the fungi seem to belong to the same species.

SPECIAL.

1. Leaf-fungi do not require much preparation. The leaves may be put between sheets of newspaper and pressed and dried in the ordinary way. Do not forget the name of the host-plant.

2. Fungi of hard (woody or carbonaceous) consistency should be dried in the open air. Keep them in a dry well-aired room for two or three days. This simple way of preparing specimens will always do for Thelephoraceæ, Clavariaceæ, Gastromycetes, Discomycetes and Hypocreales.

If enveloped in paper or kept in boxes before thoroughly dry, the specimens will be attacked and spoilt by moulds.

3. Big specimens of Polyporaceæ should be treated in the same manner. It often happens that fine specimens are packed and sent to Europe, but on their arrival nothing is to be found but a powdery mass. The fungus has become a prey of insects.

The practical instruction given by C. G. Lloyd in his 'Mycol. Notes, p. 36,' might be useful in this connection :—

> "The principal trouble that many have in making collections of fungi is that specimens are apt to be eaten by insects. This is very discouraging, but we have learned now how to avoid it in a very simple manner. In the old collections where specimens are pasted on sheets they have to be poisoned with a solution of corrosive sublimate and alcohol, but this is very objectionable from the fact that it changes materially the condition of the specimens and they are not in their natural condition after going through the poisoning process. It was formerly my custom when I received specimens to submit them to the fumes of carbon bisulphide, which is fatal to insect life, but I have found that while it may kill the insects in the specimens it does not kill the chrysalis, and specimens

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

submitted to the fumes may have chrysalides which will hatch out and eventually destroy the specimen. I learned from Mr. Romell of Stockholm a very simple process which is as inexpensive as it is effectual for specimens that are preserved in boxes, but of course does not apply to specimens pasted on sheets. Simply put in each box a liberal quantity of flake naphthalene. For boxes the size of No. ½ and No. 1 a teaspoonful, and for larger boxes a larger quantity in proportion. Flake naphthalene does not affect the specimens at all, but it kills the insects, not only those that may be in the plant, but those that develop afterwards. I have recently gone through our private collection of some ten thousand specimens or more and dumped into each box a sufficient quantity of this flake naphthalene. I do not anticipate there will ever be any trouble in future with insects in my collection. Flake naphthalene is comparatively inexpensive, and two or three pounds will take care of two or three hundred specimens. It costs about fifteen cents per pound."

4. As to the fleshy slender Agarics which always cause great difficulties, there are a good many species which may be treated as mentioned under No. 2. We have adopted this method with success in numerous cases, even with those species which have delicate cartilaginous stalks like Marasmius (cf. Fig. 6). But a great number of the fleshy Agarics resist any attempt to dry them. There are even some (Coprinus, etc.), which regularly melt into a black gelatinous mass as soon as they are ripe. These must be preserved in tubes filled with alcohol.

5. Of the Hymenomycetes spores should be procured. For this purpose fresh specimens must be put on a slide, or a piece of window-glass, or dark paper in such a way that the lamellæ (in Agarics) or tubes (in Polyporeæ) or teeth (in Hydnaceæ) or the smooth surface (in Telephoraceæ) look towards the glass or paper. After a few hours the spores will fall away, covering the glass with a fine layer of white or reddish powder. The glass or paper should then be wrapped up in paper and packed together with the dried specimen. Care must be taken not to mix up the corresponding powders and specimens.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

II

List of Fungi.

Note.—The area dealt with comprises British India, including Burma. Baluchistan, Ceylon, the Andaman and Nicobar Islands have not been considered.

Our present article does not include the Uredinales, Phycomycetes, Fungi imperfecti and Myxomycetes.

Many species, specially the older ones, require a critical revision It is evident from this that much of our list is only of provisional value. As to more recent critical publications we made use of C. G. Lloyd's 'Gastromyceten' and 'Polyporaceen,' and our own investigations on Microthyriaceæ, Perisporiales, and Xylariaceæ.

A.—ASCOMYCETES.

1.—Perisporiales.

Sphærotheca pannosa, (Wallr.) Lév. Syll. I, p. 3.

Locality unknown. Known from Europe and N. America.

Erysiphe communis, (Wallr.) Fr. Syll. I, p. 18.

„ **Martii,** Lév. Grevillea VI, p. 117.

Simla, on leaves of *Populus ciliata,* Wall.

Eurotium herbariorum, Link-Syll. I, p. 26.

Bengal, Chittagong, Burma ; common on various substances. (Cooke Grevill. IV, p. 117.)

Balladyna Butleri, Syd. p. 388.

On leaves of *Bambusa,* Khasi Hills.

Limacinula Butleri, Syd. p. 385.

On leaves of *Artocarpus mysorensis,* Vayitri, Wynaad.

Limacinula Theæ, Syd. et Butl., p. 386.

On leaves and branches of *Camellia Theæ,* Rungmook, Darjeeling.

Capnodium, mangiferum, C. et Br. Syll. I, p. 77.

Syn.: *Dimerosporium mangiferum,* (Cooke) Sacc. l. cit., p. 53.

On leaves of *Mangifera indica,* Mysore.

Capnodium lanosum, Cke. Grevill. VIII, p. 96.

On leaves of *Ficus,* Belgaum.

Capnodium Eugeniarum, Cke. l. cit.

On leaves of *Jambosa vulgaris,* Belgaum.

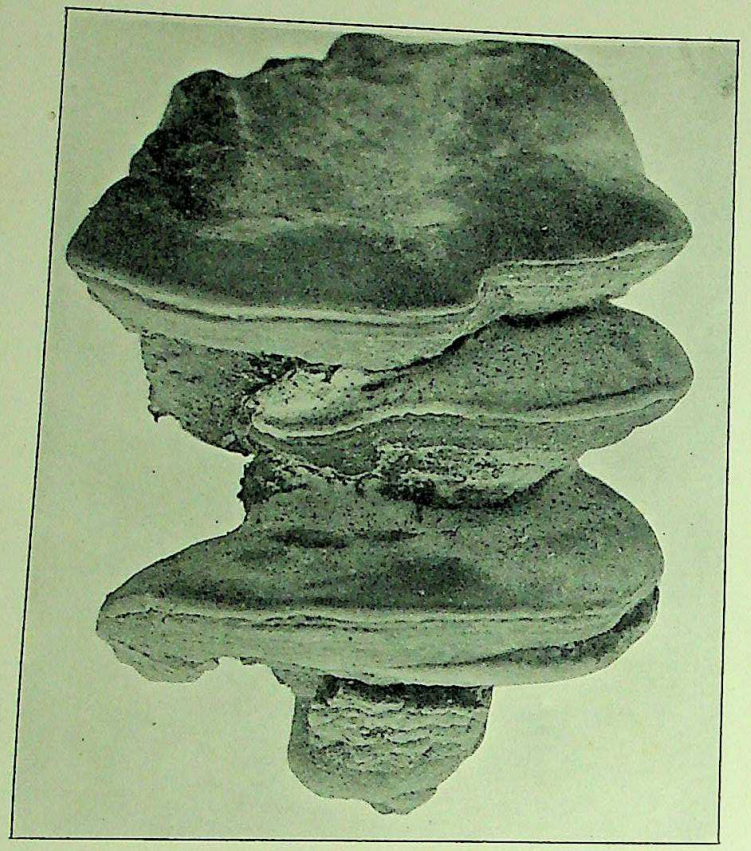
Capnodium Anonæ, Pat.—Syd., p. 384.

On leaves and branches of *Ficus retusa, Agave Vera-Cruz,* etc. Bilikere, Mysore ; on *Ficus glomerata, retusa, bengalensis,* Hassan, Mysore.

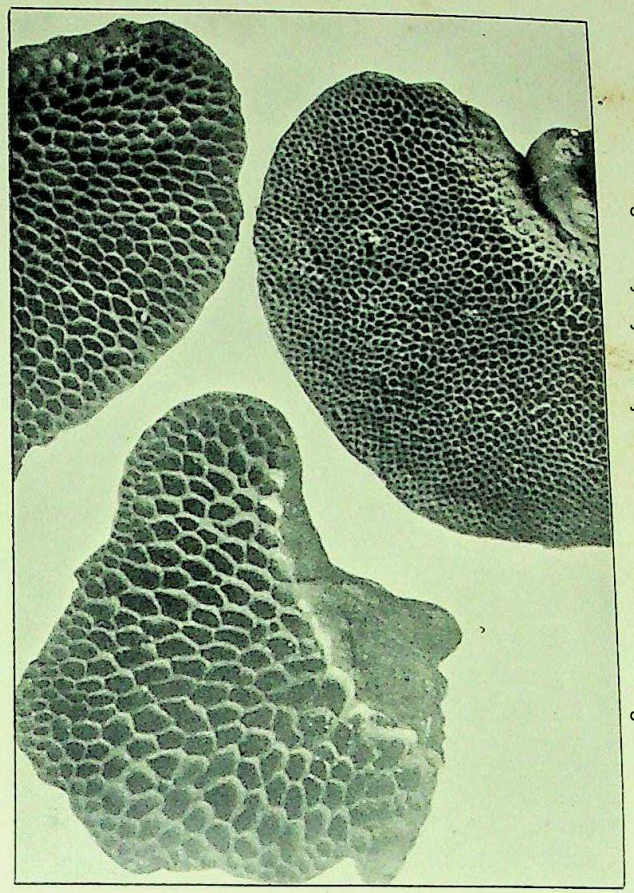
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



A.—*Fomes homodermus.*



B.—*Hexagona Pobeguini.*

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This species was originally described from the Gambier Islands, Polynesia (Syll. XVII., p. 555).

Capnodium betle, Syd., p. 384.

On leaves of *Piper betle*, Dacca ; Mudon, Amherst District, Burma.

Capnodium brasiliense, Putt.—Syd. l. cit.

On leaves and branches of, *Coffea arabica*, Tuttapullum, Nilgiris.

Parodiella perisporioides, (B. et. C.) Speg.

On leaves of some leguminous plant, Bombay (Cooke in Grevill. IV., p. 117) ; on cultivated (imported !) *Medicago lupulina*, Dehra Dun ; on *Desmodium rufescens*, Wahjain, Assam ; on *Indigofera trifoliata*, Kistna District, Madras (Syd., p. 383). The species occurs throughout the tropics.

Lasiobotrys Lonicerae, Kze. Syd., p. 384

On leaves and branches of *Lonicera*, Harwan, Kashmir ; on leaves of *Lonicera*, Bhowali, Naini.

Acanthostoma Wattii, (Syd.) Theiss.

Syn. *Dimerium Wattii*, Syd., p. 383. (cfr. Theissen, Zur Revision d. G. Dimerosporium, Beih. Bot. Centr. Blatt 1912). On leaves of *Camellia Thea*, Dunmur Dullung, Sibsagar District, Assam ; Darjeeling.

[**Dimerosporium Fumago,** (Niessl.) Sacc.]

Syn. *Meliola Fumago*, Niessl.

On leaves of *Celastrus*, Calcutta.

This species is *Asterina crustosa* (cfr. Theissen, Fragmenta brasilica VI. in Ann. myc. 1912).

[**Dimerosporium aterrimum,** Cke. et Wint. Grevill. XX, p. 83.]

On coriacious leaves, Manipur.

Species imperfectly known (cfr. Theissen, l. cit.).

Dimerosporium erysiphoides, Earle.

On leaves of *Cynodon dactylon*, Pusa ; on *Paspalum scrobiculatum*, Bassein, Bombay Presidency. (Syd. p. 383).

Meliola zig-zag, B. et Br.

Grevill. VIII, p. 96, Belgaum ; Syd., p. 383, on *Cinnamomum*, Wahjain, Assam.

Meliola densa, Cooke, Grevill. XII, p. 85.

On leaves of *Ilex* (?) Khasia.

Meliola amphitricha, Fr.

Grevill. VIII, p. 96, Belgaum; Syd., p. 379, on leaves of *Terminalia Catappa*, Auda Tode, Wynaad. This species occurs throughout the tropics.

Meliola asterinoides, Wint. var. **maior,** Gaill.

Type from Africa ; Syd, p. 379, on leaves of *Webera corymbosa*, Bilikere, Mysore.

Meliola Butleri, Syd. l. cit.

On *Citrus medica* var. *acida*, Chittagong ; on *Citrus decumana*, Kya-in, Amherst District, Burma.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Meliola cladotricha, Lév.

Syd., p. 380, on leaves of *Eugenia jambolana,* Cottamunda, Wynaad; on leaves, Kya, Amherst Dist.

Known originally from Borneo, New Guinea and Australia.

Meliola clavulata, Wint.

Syd., l. cit., on leaves of *Ipomoea* Tellicherry, Malabar; Pulliyanur, Travancore; on *Argyreia hirsuta,* Balehonnur, Mysore.—Known originally from Africa.

Meliola Diospyri, Syd., p. 381.

On *Diospyros montana,* Sidrabunna, Koppa, Mysore.

Meliola geniculata, Syd. l. cit.

On leaves of *Odina wodier,* Pulliyanur, Travancore.

Meliola indica, Syd., p. 382.

On *Barringtonia acutangula,* Dacca.

Meliola Mangiferae, Earle.

Syd. l. cit., on *Mangifera indica,* Pulliyanur, Travancore.—Originally known from Portorico.

Meliola palmicola, Wint.

Syd. l. cit., on *Phœnix,* Mudigere, Mysore; Chittagong; Burdwan, Bengal; Hunsur, Mysore; Ramachendrapur, Godavari.—Syn.: *M. contigua* K. et R.; known from Florida and Tonkin.

2.—Microthyriales.

Asterina pemphidioides, Cke. Grevill. V, p. 16.

Syn.: *Ast. crustosa* B. et Cke.

Ast. Fumago (Niessl.) v. H.

On leaves (locality unknown): Grev. l. cit; on *Eugenia jambolana,* Godavari (Syd., p. 390), cfr. on this species Theissen, Fragmenta Brasil. No. 109, 201 (Annal. mycol. 1911).

[**Asterina concentrica,** Cke. Grevill. XIV. p. 13.]

On culms of *Saccharum,* N. W. India. Belongs to the Dothideaceæ (cfr. Theissen, Fragm. brasil. No. 90), without fruit and cannot be further considered.

[**Asterina scutellifera,** Berk. Syll. I, p. 50.]

On leaves of *Antidesma,* Chittagong.—Undeveloped, cfr. Theissen l. cit. No. 102.

Asterina congesta, Cke. Grevill. VIII, p. 96.

On leaves of *Santalum album,* Belgaum.

Asterina carbonacea, Cke. Grevill. l. cit.

On coriaceous leaves, Belgaum.

[**Asterina cincta,** Berk. Syll. I, p. 43.]

On leaves of *Camellia,* Khasia.—This undeveloped and wrongly described species is to be replaced by the following:

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Asterina Camelliae, Syd. et Butl. Syd. p. 389.

On *Camellia Thea,* Dunmur Dullung, Sibsagar District, Assam. Cfr. Theissen, Fragm. bras. n. 169.

Asterina Capparidis, S. et B.-Syd. p. 390.

On *Capparis,* Madras.

Asterina incisa, Syd. l. cit.

On *Webera corymbosa,* Balehonnur, Mysore.

Asterina indica, Syd., l. cit.

On *Symplocos,* Darjeeling.

Asterina Lawsoniae, P. H. et Nym Syd. l. cit.

On *Lawsonia alba,* Pusa.

Originally described from Java.

Asterina magnifica, Syd. et Butl. l. cit.

On *Terminalia,* Moulmein, Burma.

Asterina malabarensis, Syd. l. cit.

On *Pothos scandens,* Kanouth, Malabar.

Asterina spissa, Syd., p. 392.

On *Jasminum,* Chittagong.

Asterina Stuhlmanni, P. Henn. Syd. l. cit.

On *Ananassa sativa.*—Original from Africa.

Microthyrium microscopicum, Desm.

Grevill. VIII, p. 96, Belgaum.

Calothyrium aspersum, (Berk.) Theiss.

Syn.: *Asterina aspersa,* Berk. Syll. I, p. 45.

Microthyrium aspersum, (Berk.) v. H.

On leaves of *Laurus,* Khasia. Cfr. Theissen, Zur Revision d. G. Microthyrium No. 17 (Oest. Bot. Zeitschr. 1912).

Seynesia grandis, (Niessl.) Wint. Syll. IX, p. 1064.

On dry culms of *Calamus,* Calcutta.

Vizella conferta, (Cke.) Sacc.

Syn.: *Micropeltis conferta,* Cooke Grevill. VI, p. 118.

On leaves of "Bhauri" (*Symplocos spicata*), Dinagepore.

Myiocopron orbiculare, (Cke.) Sacc.

Syn.: *Micropeltis orbicularis,* Cooke Grevill. VI, p. 118.

On *Symplocos spicata,* Dinagepore.

3.—HYSTERIINEÆ.

Lembosia caespitosa, (Cooke) Sacc.

Syn.: *Ailographium cæspitosum,* Cke. Grev. VIII, p. 95.

On coriaceous leaves, Belgaum.

Aulographum vagum, Desm. Syll. II, p. 727.

On coriaceous leaves, Himalaya.

Lophodermium Pinastri, (Schrad.) Chev.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Syn., p. 378, on *Pinus excelsa*, Achibal, Kashmir.

Acrospermum parasiticum, Syd. l. c.

On leaves of *Heptapleurum venulosum*, Kumaon, Himalaya.

4.—PLECTASCINEÆ.

Thielavia basicola, Zopf. Syd. l. cit.

On roots of *Viola odorata*, Lahore.

Originally described on roots of Senecio elegans, in the Bot. Gardens Berlin.

5.—DISCOMYCETES.

Helvelia crispa, Fr. Grevill. IX, p. 13 ; Syll. VIII, p. 18.

On the ground, Punjab ; Syd., p. 374, Achibal, Kashmir.

Morchella bohemica, Kromb. Syll. VIII, p. 10.

Grevill. V., p. 16, on the ground, Kashmir. "Eaten by the natives; dried and sent down into the plains." (It seems doubtful, whether the identification was correct; it was, perhaps, the following.

Morchella esculenta, Pers. Syll. viii, p. 8.

Grevill. V., p. 16, on the ground, Kashmir ; Syd., p. 374.

Amritsar ; Ranikhet, Kumaon, Himalaya.

Morchella deliciosa, Fr. Syll. VIII, 10.

Syd., p. 374, on the ground, Amritsar.

Morchella conica, Pers. Syll, VIII, p. 9.

On the ground, Dehra Dun (Theissen, F. Bombay. Ann. mycol. 1911, p. 158) var. *acuminata*, Kickx.

Siwalik Range (P. Henn. F. Ind. Orient. II, Hedwigia 1901, p. 338).

Rhizina reticulata, B. et Br. Syll. VIII, p. 58.

On the ground, Neilgherries.

Rh. zonata, Berk. Syll. VIII, p. 59.

Amongst *Pinus* leaves, Darjeeling.

Peziza epispartia, B. et Br. Syll. VIII, p. 89.

Grevill VIII, p. 96, Belgaum.—Type from Ceylon.

Otidea darjeelensis, Cooke.—Syll. X, p. 4.

Darjeeling, on the ground.

Lachnea geneospora, Berk.—Syll. VIII, p. 178.

On wood; locality unknown.

Helotium pusense, Syd., p. 374.

On twigs of *Ricinus communis*, Pusa.

Ombrophila indica, Syd., p. 375.

On rotten wood, Dehra Dun.

Pseudopeziza Medicaginis, (Lib.) Sacc.

Syd., p. 375, on leaves of *Medicago sativa*, Poona ; on *Medicago lupulina*, Harwan, Kashmir.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Known from Europe, South America, Siberia.

Pseudopeziza repanda, (Fr.) Karst. Syll. VIII, p. 727.

Syd. l. cit. on leaves of *Galium*, Kasauli.

Known from Europe.

Pseudopeziza trifolii, (Biv. Bernh.) Fuck.—Syll. VIII, p. 723.

Syd. l. cit. on leaves of *Trifolium pratense*, Verinag, Kashmir.

Chlorosplenium ærugineum, (Berk.) Sacc.—Syll. VIII, p. 318.

Syn. : *Peziza æruginea*, Berk.

On decayed wood, Khasia.

Lachnella nilgherrensis, Cke.—Syll. X, p. 20.

Grevill. XIX, p. 73, in caulibus herbaceis; locality unknown.

Dasyscypha Emerici, (Berk. et Phil.) Sacc. Syll. X, p. 22.

Grevill. XIX, p. 74, on branches, Neilgherries.

Bulgaria chalybaea, (Berk.) Cke. et Mass. Syll. X, p. 41.

Grevill. XIX, p. 41, on wood, Darjeeling.

Lagerheimia Carteri, (Berk.) Sacc. Syll. X, p. 55.

Syn. : *Patellaria Carteri*, (Berk.) Phil.

Grevill. XIX, p. 75, on dead wood, Bombay.

Aleurina orientalis, (Pat.) Sacc. et Syd.

Syn. : *Phæopezia orientalis*, Pat. Syll. X, p. 24.

Syd., p. 374, on cow dung, Pusa.—Type from Tonkin.

Saccobolus Kerverni (Crouan) Boud.—Syll. VIII, p. 524.

Syd., l. cit., on horse dung, Pusa.—Common European species.

Tryblidiella rufula, (Spreng.) Sacc.

Syd., p. 375, on branches of *Citrus*, Sagaryng, Burma; Pulliyanur, Travancore; Dehra Dun.—Known also from N. America and Brazil.

Pseudophacidium indicum, Syd., p. 375.

On branches, Dehra Dun.

Phacidium symplocinum, Syd., p. 376.

On living leaves of *Symplocos*, Darjeeling.

Cryptomyces Pongamiae, (B. et Br.) Sacc.

Syd. l. cit. on leaves of *Pongamia glabra*, Islampur, Bombay Presidency.

Schizothyrium annuliforme, Syd., p. 376.

On living leaves of *Acer oblongus*, Mussoorie.

Coccomyces vilis, Syd. et Butl.—Syd., p. 377.

On leaves of *Mangifera indica*, Malda.

Rhytisma conoideum, Cooke. Syll. VIII, p. 761.

Grevill. V, p. 16, on leaves (sterile).

Rhytisma durissimum, Cooke l. cit.

On coriaceous leaves (sterile).

Rhytisma ustulatum, Cooke Grevill. V, p. 17.

On dead leaves (*Ficus* ?).

Rhytisma fuscum, Fr.—Syll. VIII, p. 759.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

On *Sapindacea* (sterile).

The last three species are very doubtful.

Rhytisma acerinum, (Pers.) Fr.

Syd., p. 377, on leaves of *Acer cæsius*, Harwan, Kashmir; Darjeeling.

Rhytisma himalense, Syd. et Butl.—Syd., p. 377.

On leaves of *Ilex* (*dipyrena* ?), Ranikhet, Kumaon, Himalaya.

Rhytisma piceum, Berk.—Syll. VIII, p. 762.

Syn.: *Rhytisma pieridis*, Pat.—Syll. XIV, p. 817, from Tonking.

Tambur Vall, Nepal. Syd., p. 378, on *Pieris*, Ranikhet, Kumaon, Himalaya; on *Pieris ovalifolia*, Nepal.

6.—Dothideales.

Phyllachora demersa, (Corda) Sacc. Syll. II, p. 595.

Syn.: *Sphæria demersa*, Corda.
Dothidea demersa, Corda.

On living leaves (Ixora ?); Grevill. V, p. 16.

Phyliachora annulata, (Cke.) Sacc. Syll. II, p. 610.

Syn.: *Dothidea annulata*, Cooke, Grevill. VIII, p. 95.

On leaves of unknown tree, Belgaum.

"A curious species, with the perithecia forming little rings, but entirely sterile."

Phyllachora Ficuum, Niessl. Syll. II, p. 598.

On leaves of *Ficus infectoria*, Calcutta; Syd., p. 395, on *Ficus mysorensis*, Yelwal, Mysore; on *Ficus mysorensis* var. *pubescens*, Wynaad.

Phyllachora infectoriae, Cke. Bilikere, Mysore; on *Ficus religiosa*, Jessore, Bengal; Syd., p. 396.

Phyllachora aspidea, (Berk.) Sacc. Syll. II, p. 598.

Syn.: *Dothidea aspidea*, Berk. (from Ceylon).

Syd., p. 396, on (*Ficus scandens* ?), Ranikhet, Kumaon, Himalaya.

Phyllachora topographica, Sacc.

Syn.: *Phyllachora marmorata*, Rac. (from Java).

Syd. l. cit., on *Ficus*, Wynaad; on *Ficus hispida*, Chittagong.

Phyllachora abyssinica, P. Henn.

Syd. l. cit. on *Ficus* sp., Assam.—(Type from Abissynia.)

Phyllachora Musae (Kl.) Sacc. Syll. II, p. 613, 625; IX, p. 1023.

Grevill. XIII, p. 64, on *Musa*.

Phyllachora repens, (Corda) Sacc. Syll. II, p. 598.

Syn.: *Dothidea repens*, Corda.

Grevill. V, p. 16, on *Ficus gossypina*; VIII, p. 95, on *Ficus religiosa*, Belgaum; Syd., p. 396, on *Ficus religiosa*, Madras.

Phyllachora rhytismoides, (Corda) Sacc. Syll. II, p. 595.

Syn.: *Dothidea rhytismoides*, Corda.

On *Acacia* sp., Tenasserim.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Phyllachora Chionachnes, Syd.—Syll. XVII, p. 839.

On living leaves of *Chionachne barbata*, Panjab.

Phyllachora viventis, (Cke.) Sacc. Syll. II, p. 601.

Syn.: *Dothidea viventis*, Cooke. Grevill. V., p. 16.

On living leaves of *Leguminosæ*.

Phyllachora Dalbergiae, Niessl—Syll. II, p. 595.

Syd., p. 397, on *Dalbergia Sissoo*, Pusa; on *Dalbergia* sp., Bilin, Burma. —Type from Calcutta.

All the following Phyllachora-species are mentioned by Sydow, p. 397, sqq.

Phyllachora Pongamiae, P. Henn.

On *Pongamia glabra*, Madras.

Phyllachora Desmodii, P. Henn.

On *Desmodium* sp., Harwan, Kashmir.

Phyllachora? tenuis, (Berk.) Sacc.

On *Bauhinia vahlii*, Kirkee, Bombay Presidency.—Type from Nicaragua.

Phyllachora? fimbristylicola, Speg.

On *Fimbristylis* sp., Dauracherra, Assam; on *F. dichotoma*.—Kanaighat Assam.

Phyllachora Coicis, P. Henn.

On *Coix lacryma Jobi*, Wynaad, Malabar.

Phyllachora Cynodontis, (Sacc.) Niessl.

On *Cynodon Dactylon*, Bankipore.—Very common.

Phyllachora Cyperi, Rehm var. **Donacis,** Berl. et F. Sacc.

On *Arundo*, Wahjain, Assam; on *Imperata arundinacea*, Khasi Hills, Assam; on *Andropogon muricatus*, Pusa; on *Saccharum spontaneum*, Pusa.

Phyllachora graminis, (Pers.) Fuck.

On *Isachne*, Kaneighat, Sylhet, Assam; on *Panicum*, Panora, Wynaad; on *Andropogon assimilis*, Kumaon, Himalaya and Dehra Dun; on *Andropogon micranthus*, Maymyo, Burma; on *Anthistiria*, Wynaad; on *Pogonatherum saccharoideum*, Kumaon, Himalaya; on *Pallinia grata*, Moulmein, Burma; on *Oryzopsis*, Wynaad; *Panicum* sp., Wahjain; *Ischœmum laxum*, Bilin, Burma; *Panicum colonum*, Champaran, Bengal; *Centotheca lappacea*, Moulmein, Burma; *Andropogon* sp., Roppa, Mysore.

Phyllachora Bischofiae, Syd.

On *Bischofia javanica*, Panora, Wynaad.

Phyllachora dolichospora, Syd.

On *Tinospora cordifolia*, Solebile, Mysore.

Phyllachora erebia, Syd.

On *Caragana* sp., Harwan, Kashmir.

Phyllachora permixta, Syd.

On *Schima wallichii*, Maymyo, Burma.

Phyllachora transiens, Syd.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

On *Eurya acuminata*, Kumaon, Himalaya.

Phyllachora spissa, Syd.

On *Dalbergia sissoo*, Wynaad.

Phyllachora malabarensis, Syd. et Butl.

On *Bambusa*, Wynaad, Malabar.

Phyllachora Shiraiana, Syd.

On *Arundinaria*, Wahjain, Assam.

Phyllachora Rottboelliae, Syd. et Butl.

On *Rottboellia exaltata*. The Droog, Nilgiri Hills.

Ophiodothis vorax, (B. et C.) Sacc. Syll. II, p. 652.

Syn.: *Dothidea vorax*, B. et C.—On *Carex*, Khasia.

Ophiodothis sclerotica, (Pat.) P. Henn. Syll. XVI, p. 633.

Syn.: *Epichloe sclerotica*, Pat. Syll. IX, p. 1002 (from Tonkin).

On the inflorescence of *Andropogon nardus*, Erramacola, Wynaad: *A. Schœnanthus*, Vayitri, Wynaad; *A. sp. sp.*, Chatrapur, Ganjam; Belgaum.

Metachora Bambusæ, Syd. et Butl.

On *Bambusa*, Kanouth, Malabar.

Bagnisiella Tamaricis, (Cke.) Sacc. Syll. II, p. 590.

Syn.: *Dothidea Tamaricis*, Cooke. Grevill. XI, p. 108.

Syd., p. 401, on *Tamarix gallica*, Pusa.—Type from N. America.

Dothidella bambusicola, Syd. et Butl.—Syd., p. 401.

On *Bambusa*, Moulmein, Burma.

Dothidella dispar., Syd. l. cit.

On *Andropogon contortus*, Tellicherry, Malabar.

Scirrhia seriata, Syd. et Butl.—Syd., p. 402.

On *Bambusa*, Moulmein, Burma.

? **Dothidea Terminaliæ**, Syd., p. 401.

On *Terminalia catappa*, Wynaad.

Apiospora camptospora, Penz. et Sacc.—Syll. XIV, p. 534.

On *Saccharum officinarum*, Bilin, Burma (Syd., p. 402)—Type from Java.

Apiospora Montagnei, Sacc. Syll. I, p. 539.

Syn.: *Sphæria apiospora*, Dur. et Mont.

Hypopteris apiospora, (Mont.) Berk.

On *Bambusa*, Nangki; Syd., p. 402, on *Bambusa*, Wynaad.—Known from Europe, Algeria, N. America.

7.—HYPOCREALES.

Polystigma ochraceum, (Wahlb.) Sacc. Syll. II, p. 458.

Syn.: *Polystigma fulvum*, DC.

Sphæria ochracea, Wahlb.

Cited in Grevill. VI, p. 117, on leaves of *Prunus Padus*, Jubal State, N. W. Himalaya (18,000 feet).—Species known from Europe.

Nectria collabens, Berk. et Cke. Syll. IX, p. 958.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Grevill. XII, p. 81, on bark, Bombay.

Nectria alutacea, B. et Cke. Grevill. XII, p. 81 Syll. l. cit.

On bark, Neilgherries.—The species belongs to the group of *N. ochroleuca* (Schw.) Berk.—Cfr. on this and other species of *Nectria*; Weese and v. Höhnel "Zur Synonymie der Nectriaceen" in Annal. myc. fasc. 4, 1910 and 1911.—*N. ochroleuca* is a widely spread species.

Nectria lætifulva, B. et Cke. Grevill. XII, p. 82; Syll. IX, p. 961.

On bark, Neilgherries.

Nectria xanthostigma, B. et Cke. ll. cit.

On herbaceous stems, Neilgherries.

Nectria bolbophylli, P. Henn. Syll. XVII, p. 790.

Syd., p. 392, on stems of *Cajanum indicum*, Dehra Dun; on bark of *Piper niger*, Vayitri, Wynaad; on *Piper betle*, Shiggaon, Bombay Presidency; on *Cocos nucifera*, Pulliyanur, Travancore; on culms of *Oryza sativa*, Chittagong.

This widely spread species shows numerous forms, such as *N. Citri*, P. Henn.; *calonectricola*, P. H.; *citricola*, P. H.; *Victoriæ*, P. H.; *luteococcinea*, v. Höhn.; *bogoriensis*, P. H., *asperata*, Rehm; *Melanommatis*, Syd. a. o.

Nectria cinnabarina, (Tode) Fr. Syll. II, p. 479.

Syn.: *N. ochracea* (Grev.) Fr. Syll. II, p. 487.

Syd., p. 393, on branches of *Populus ciliata*, Verinag, Kashmir; of *Prunus armeniaca*, Achibal, Kashmir.—The species occurs also in Europe, Ceylon, Siberia, N. America and Brazil.

Nectria subcoccinea, Sacc. et Ell. Syll. II, p. 482.

Syn.: *N. Colletiæ*, Rehm. Syll. XVI, p. 578.
N. coccidophtora, Zim. Syll. XVII, p. 784.

Syd., p. 393, on *Piper niger*, Wynaad.—The species occurs in N. America, Brazil and Java.

Nectria diversispora, Petch. Syd. l. cit.

On *Hevea brasiliensis*, Mergui, Burma.—Type from Ceylon.

Nectria heterosperma, K. et Cke. Syll. II, p. 485.

Syd., l. cit., on dead branches, Dehra Dun.—Type from South Africa.

Nectria tjibodensis, Penz. et. Sacc. Syll. XIV, p. 636.

Syn.: *N. bogoriensis*, P. H.; *ochracea*, P. H.; *Iriarteæ*, P. H.; *flocculenta* P. H. et Nym.

Syd. l. cit., on stems of *Guazuma tomentosa*, Pusa.—Known also from Java and Brazil.

Melanospora parasitica, Tul. Syll. II., p. 464.

Syd., p. 392, on *Cephalosporium Lecanii*, on leaves of *Coffea arabica*, Mysore.—European species.

Melanospora Zamiæ, Corda, Syll. II, p. 463.

Syd. l. cit., on culms of *Oryza sativa*, Noakhali.—Known from Europe and Australia.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Hypomyces chrysospermus, Tul. Syll. II, p. 467.

Syd., p. 394, on *Boletus* (?), Khasi Hills, Assam—European species.

Sphærostilbe gracilipes, Tul. Syll. II, p. 513.

Syd. l. cit., on dead branches, Pulliyanur, Travancore.—Known from Cuba and Ceylon.

Hypocrea flavo-virens, Berk. Syll. IX, p. 976.

Grevill. XII, p. 100, on bark, Neilgherries.

Hypocrea grossa, Berk. Syll. II, p. 528.

On wood—Locality unknown.

Hypocrea subrufa, Berk. Syll. IX, p. 972.

Grevill XII, p. 79, on branches, Neilgherries.

Hypocrea rugulosa, Berk. et Cooke Syll. IX, p. 973.

Grevill XII, p. 79, on rotten wood, Neilgherries; var. *maior* ibidem, on bark of trees.

Hypocrea undulata, B. et Cke. Grevill. XII, p. 79.

Syn.: *Hypocreopsis undulata* (B. et Cke.) Sacc. Syll. IX, p. 981.

On rotten wood, Neilgherries.

Hypocrea Nilgherrensis, B. et Cke. Syll. IX, p. 979.

Grevill. XII, p. 79, on bark, Neilgherries.

Hypocrea Carteri, B. et. Cke. Grevill. XII, p. 79.

Syn.: *Hypocreopsis Carteri* (B. et Cke.) Sacc. Syll. IX, p. 981.

On bark, Bombay.

Pleogibberella calamia, (Cooke) Berl. et V. Syll. IX, p. 992.

Syn.: *Gibberella calamia,* Cooke.

On *Calamus fasciculatus*; locality unknown.

Balansia andropogonis, Syd., p. 395.

On the inflorescence of *Andropogon aciculatus,* Forbesganj, Purnea, Bengal.

Cordyceps Ridleyi, Mass. Syll. XVI, p. 611.

On ant, Selangor.

Cordyceps falcata, Berk. Syll. II, p. 575.

On larvas; locality unknown.

Cordyceps racemosa, Berk. Syll. II, p. 576.

On larvas; locality unknown.

Epichloe cinerea, B. et Br. Syll. II, p. 579.

Syd., p. 394, on the inflorescence of *Eragrostis tenuifolia,* Hunsur and Bilikere, Mysore—Type from Ceylon.

Epichlœ Bambusae Pat., Syll, XIV, p. 655.

Syd., p. 395, on culms of *Bambusa,* South India.—Type from Java.

Hypocrella semiamplexa, (Berk.) Sacc. Syll. II, p. 581.

On *Bambusa*; locality unknown.

Hypocrella Panici, Mass. Syll. XVI, p. 603.

On culms of *Panicum,* Selangor.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Endothia hypocreoides, (B. et Cke.) v. Höhn.

Syn.: *Nectria hypocreoides*, B. et Cooke, Grevill. XII, p. 81.

Syll. IX, p. 958, on bark, Bombay.—Cfr. Weese et v. Höhn. in Ann. mycol. 1910, p. 466.

Neocosmospora vasinfecta, Smith. Syll. XVI, p. 562.

Syd., p. 394, on roots of *Cajanum indicum*, *Crotalaria juncea*, *Indigofera arrecta*, *Cicer arietinum*, Pusa.—Type from North America.

On the morphology of this species and its saprophytic nature in East India Cfr. E. J. Butler. "The wilt disease of pigeon pea and the parasitism of *Neoc. vasinfecta* (Mem. Dept. of Agric. in India, Botan. Series II, No. 9, Jan. 1910).—This species was also observed in India, on *Vigna Catjang*, *Cyamopsis psoraloides*, some cultivated *Gossypium*-species and *Indigofera sumatrana*." (Syd. l. cit.)

8.—MYRIANGALES.

Myriangium Durieui, Mtg. et Berk.

Syd., p. 395, on bark, Pusa.

9.—SPHÆRIALES.

Apiospora Montagnei (Pass.) Sacc. Syll. I, p. 539.

On *Bambusa*, Nangki.

Læstadia Theæ, Rac.

?Syn.: *L. Camelliæ* (Cke.), Berl. et V.

Syd., p. 406, on leaves of *Camellia Thea*, Dooars, Bengal.—Type from Java.

Læstadia perusia (B. et Br.), Sacc. Syll. I, p. 430.

Syd. l. cit., on leaves of *Dioscorea*, Chittagong.—Type from Ceylon.

Sphærella Bhauria, Cooke-Syll. I, p. 489.

Grevill. VI, p. 118, on leaves of "Bhauri" (*Symplocos spicata*), Dinagepore.

Physalospora Bambusæ (Rabh.), Sacc. Syll. I, p. 496.

Syn.: *Sphæria Bambusæ*, Rabh.

On leaves of *Bambusa spinosa*, Calcutta Bot. Garden.

Physalospora Calami, Syd., p. 407.

On *Calamus tenuis*, Chittagong.

Physalospora transversalis, Syd., p. 407.

On leaves of *Cocos nucifera*, Bilin, Burma.

Physalospora ventricosa (Dur. et Mtg.), Cke. Syll. XI, p. 292.

Syd., p. 408, on dead twigs of *Ricinus communis*, Pusa.—Type from North Africa.

Physalospora xanthocephala, Syd., p. 408.

On branches of *Cajanum indicum*, Pusa.

Anthostomella Pandani (Rabh.), Sacc. Syll. I, p. 292.

Syn.: *Sphæria Pandani*, Rabh.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

On leaves of *Pandanus furcatus*, Calcutta.

Anthostomella Bambusæ (Lév.), Sacc. Syll. I, p. 289.

Syn. *Sphæria Bambusæ* Lév.

Hypopteris Bambusæ Berk.

On culms of *Bambusa arundinacea*, Nangki.

Metasphæria Boehmeriæ (Rabh.), Sacc. Syll. II, p. 156.

Syn.: *Sphaerella Bœhmeriæ*, Rabh.

On dry stems of *Bœhmeria nivea*, Calcutta.

[illegible]sphæria celastrina, Syd. et Butl., p. 408.

On dead branches of *Celastrus*, Pusa.

Paranthostomella Capparidis, Syd. et Butl., p. 408.

On leaves of *Capparis spinosa*, var. *cucophylla*, Pusa.

Leptosphæria Agaves, Syd. et Butl., p. 409.

On leaves of *Agave rigida*, var. *Sisalana*, Douracherra, Assam.

Leptosphæria Eriobotryæ, Syd. et Butl., p. 409.

On leaves of *Eriobotrya japonica*, Saharanpur.

Leptosphæria indica, Syd. et Butl., p. 409.

On leaves and twigs of *Asparagus*, Wynaad.

Leptosphæria Sacchari, v. Breda. Syll. XI, p. 324.

Syd. l. cit., on leaves of *Saccharum officinarum*, Dehra Dun; Bilin, Burma.—Type from Java.

Ophiobolus Cajani, Syd., p. 409.

On dead twigs of *Cajanum indicum*, Pusa.

Ophiobolus Manihotis, Syd., p. 410.

On *Manihot utilissima*, Pulliyanur, Travancore.

Ophiobolus Porphyrogonus, (Tode), Sacc. Syll. II, p. 338.

Syd., p. 410, on stems of *Vigna Catjang*, Pulliyanur, Travancore.—Known from Europe, North and South America.

Pleospora spinarum, Syd., p. 410.

On spines of *Astragalus*, Achibal, Kashmir.

Massarina usambarensis, (P. Henn.) v. Höhn. Fragm. Z. Myk. XII, p. 46.

Syn.: *Holstiella usambarensis*, P. Henn. Syll. XIV, p. 594.

Syd., p. 410, on bark of *Feronia elephantum*, Chittagong.—Type from Africa.

Massaria marginata, Fuck. Syll. II, p. 9.

Syd. l. cit., on twigs of *Rosa*, Harwan, Kashmir.—European species.

Pleomassaria ilicina, Syd. et Butl., p. 411.

On bark of *Ilex* (*dipyrena* ?), Ranikhet, Kumaon, Himalaya.

Astrocystis mirabilis, B. et Br. Syll. I, p. 293.

Syd. l. cit., on culms of *Bambusa*, Bulsar, Bombay Presidency.—Type from Ceylon.

Trabutia ambigua Syd., p. 411.

On leaves of *Eugenia Jambolana*, Koppa, Mysore.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Trabutia cayennensis, (D C.), Sacc. Syll. I, p. 449.

Syn. : *Xyloma cayennense,* D C.

Sphæria cayennensis (D C.), Fr.

On *Myrtacea* ; locality unknown.—Type from South America.

Sphæria constellatio, Berk. Syll. II, p. 398.

On leaves, Khasia.

Trichosphæria macularis, Syd. et Butl., p. 402.

On leaves, Pulliyanur, Travancore.

Melanomma citricola, Syd. et Butl., p. 405.

On bark of *Citrus medica,* Chittagong.

Melanomma glumarum, Miyake.

Syd., p. 406, on culms and glumes of *Oryza sativa,* Chittagong.

Rehmiomyces profusus, Syd. et Butl.

On dead branches of *Cajanum indicum,* Dehra Dun.

Boerlagella effusa, Syd. et Butl., p. 403.

On wood and branches of *Populus ciliata,* Mussoorie.

Acanthostigma heterochæta, Syd. et Butl., p. 403.

On living leaves of *Phaseolus Mungi,* var. *radiatus,* Pusa ; on *Dumassia villosa,* Nagpur ; on *Dumassia sp.,* Samalkota.

Rosellinia picta (Berk.), Cooke Grevill, XV, p. 81 ; Syll. IX, p. 496.

Syn. : *Hypoxylon pictum,* Berk.

On decorticated wood, Neilgherries.

Rosellinia andurnensis, Ces. et de N. Syll. I, p. 253.

Syd., p. 404, on dead twigs, Dehra Dun.—European species.

Rosellinia bunodes, (B. et Br.), Sacc. Syll. I, p. 254.

Syd., p. 404, on stumps of *Litsæa angustifolia,* Hassan, Mysore.—Type from Ceylon, known also from Java.

Syd. l. c. : "*Rosellinia bunodes* causes on *Piper nigrum* in Mysore and other trees (*Litsæa Wightiana, Sehleichera trijuga, Holigarna longifolia, Grevillea robusta*) a disease known as 'stump rot' which is fatal to the trees attacked. Massee was the first to draw the attention to this disease of the Black Pepper (Kew Bull. 1895, p. 178), but did not identify it. It has been figured by Penzig and Sacc. in Ic. F. Jav. t. IV, f. 4, and described by Petch in 'Revisions of Ceylon Fungi' II, p. 434."

Rosellinia Mangiferæ, Syd., p. 405.

On bark of *Mangifera indica,* Chittagong.

Rosellinia picacea, Mass. Syll. XVI, p. 438.

On dead bark, Bot. Gardens, Singapore.

Rosellinia echinata, Mass. Syll. XVII, p. 597.

On roots of *Ficus dubia,* Bot. Gardens, Singapore.

Amphisphæria Khandalensis, Rehm.

On *Bambusa,* Khandala. Cfr. Theissen, "F. Bombayenses" in Ann. Mycol. 1911, p. 158.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Chætosphæria indica, Niessl. Syll. II, p. 96.

On leaves of *Alangium decapetalum,* Calcutta.

Chætomium indicum, Corda. Syll. I, p. 220.

Grevill. IV, p. 117., on paper, Burma.

Chætomium amphitrichum, Corda, Syll. I, p. 228.

Syd., p. 402, on dead palm-leaves, Tenasserim; on trunks of *Gossypium indicum,* Nagpur.

Cucurbitaria Agaves, Syd. et Butl.

Syd., p. 406, on leaves of Agave, Dehra Dun.

Corynelia clavata (L.), Sacc. Syll. IX, p. 1073.

On *Podocarpus,* Khasia.—Known from Africa, New Zealand, Venezuela. Syll. XVI, p. 650 gives as synonyms *Alboffia oreophila,* Speg. (from Argentina) and *Trullula tropica* (Awd. et Rabh.) Sacc. from Chile.

Corynelia fructicola (Pat.) v. Höhn.

Syn.: *Capnodium fructicolum,* Pat. Syll. IX, p. 441.

Syd., p. 406, on fruits of *Myrsine africana,* Mussoorie.—Type from China.

Valsa nepalensis (Berk.), Sacc. Syll. I, p. 125.

Syn.: *Sphæria nepalensis,* Berk.

On dead branches of *Betula,* East Nepal.

Valsa Corchori, Syd. et Butl., p. 412.

On branches of *Corchorus sp.,* Poona.

Cryptovalsa Rabenhorstii (Nke.), Sacc. Syll. I, p. 190.

Syn.: *Valsa Rabenhorstii,* Nke.

Sphaeria spiculosa, var. *Robiniae,* Rabh.

Syd., p. 412, on cultivated *Morus,* Pusa.—European species.

Cryptovalsa indica, Syd., p. 412.

On corticated branches, Dehra Dun.

Cryptovalsa planiuscula, Syd. et Butl. l. cit.

On dead branches, Pusa.

Allescherina Boehmeriæ, Syd. et Butl., p. 413.

On dead branches of *Bœhmeria nivea,* Pusa.

Allescherina Cajani, Syd. et Butl. l. cit.

On dead branches of *Cajanum indicum,* Pusa.

Eutypella Zizyphi, Syd. et B., p. 413.

On dead branches of *Zizyphus jujuba,* Pusa.

Eutypella Vitis (Schw.), E. et E.—Syd. l. cit.

On wood of *Vitis vinifera,* Poona.—Type from North America.

Peroneutypella ambiens, Syd., p. 414.

On decayed twigs, Dehra Dun.

Peroneutypella indica, Syd. et B., p. 414.

On dead branches of *Dalbergia Sissoo,* Pusa.

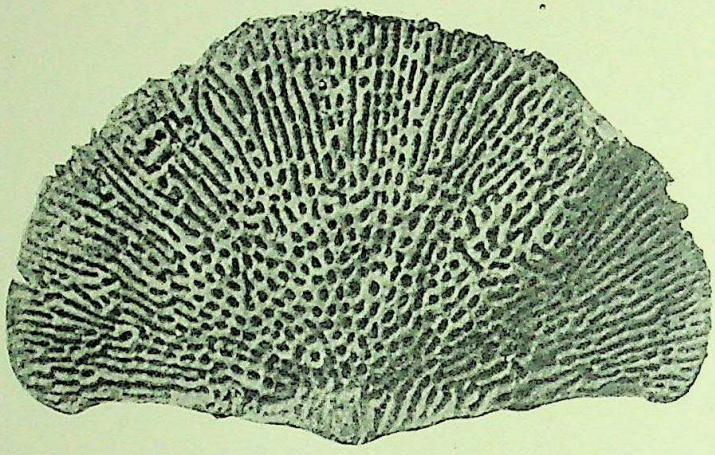
Peroneutypella pusilla, Syd. l. cit.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

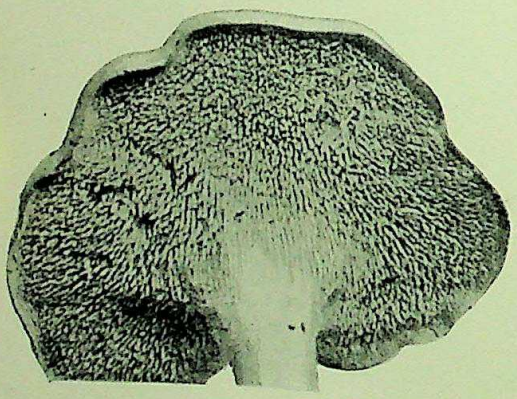
Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

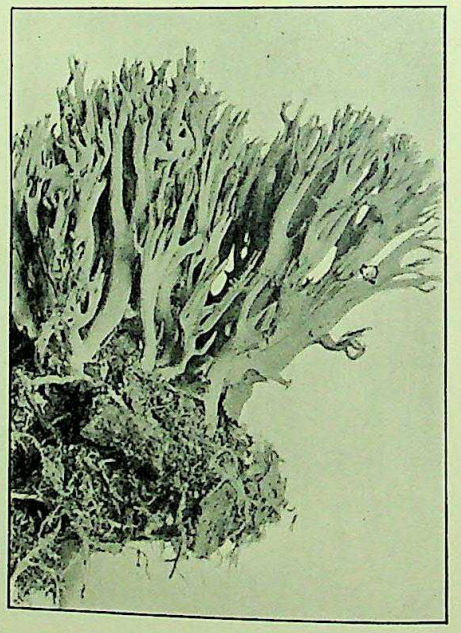
Digitized by Arya Samaj Foundation Chennai and eGangotri



A



B



C

A.—*Lenzites ochroleuca.*

B.—Under Surface of a *Hydnum.*

C.—*Clavaria cinerea.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

On dead corticated branches of *Citrus*, Sagaing, Burma.

Anthostoma Carteri (B. et Cke.), Berl. et V. Syll. IX, p. 520.

Syn.: *Fuckelia Carteri*, B. et Cooke Grevill. XII, p. 51.

On bark, Bombay.

Diatrype chlorosarca, B. et Br. Syll. I, p. 195.

Syd., p. 415, on dead culms of *Bambusa*, Tellicherry, Malabar; on branches, Pulliyanur, Travancore; Dehra Dun; Palghat.

Malabar.—Type from Ceylon.

Botryosphæria Agaves (P. Henn.), Butl.

Syn.: *Physalospora Agaves*, P. H. Syll. XVII, p. 585.

Syd., p. 415, on leaves of *Agave*, Pusa.—Type from East Africa.

Botryosphæria egenuia, Syd. et Butl.—Syd. p. 415.

On leaves of *Cymbidium*, Gauhati, Assam.

Hypoxylon ochraceo-fulvum, B. et Cke. Syll. IX, p. 554.

Grevill. XI, p. 133, on bark, Nirwab Jungle.

Hypoxylon deciduum, B. et Br. Syll. I, p. 369.

On palm-leaves, Ceylon, Borneo, India.

Hypoxylon perforatum (Schw.), Fr. Syll. I, p. 375.

On wood, Europe, N. America, Ceylon, India.

Hypoxylon udum (Pers.), Fr. Syll. I, p. 386.

Syn.: *Sphaeria confluens*, Tode.
Sphaeria albicans, Pers.
Sphaeria ordinata, Fr.
Sphaeria lineata, D C.

On wood, Europe, Borneo, India.

Hypoxylon vividum, B. et Br. Syll. I, p. 359.

On bark, Bombay (Theissen, *F. Bombayenses*, Ann. mycol. 1911, p. 159; Syd., p. 417). Type from Ceylon.—Syd., p. 417, on wood, Chittagong Calcutta; Pusa; Surat.

Hypoxylon coccineum, Bull. Syll. I, p. 353.

On wood, Europe, N. America, Australia, Cuba, India.

Hypoxylon multiforme, Fr. Syll. I, p. 363.

On wood, Europe, N. America, Kamtschatka, India.

Hypoxylon Hookeri, Berk. Syll. IX, p. 548.

Grevill. XI, p. 129. On wood, India; locality unknown.

Hypoxylon atropurpureum, Fr. Syll. I, p. 375.

On wood, Europe, N. America, South America, Java, India; Syd., p. 475. On wood of *Tamarindus indica*, Surat.

Hypoxylon fusco-purpureum, (Schw.) Fr. Syll. I, p. 378.

Syd., p. 416, on dead culms of *Bambusa*, Bulsar, Bombay Presidency.—Occurs also in N. America, Cuba and Brazil.

Hypoxylon stygium, (Lév.) Sacc. Syll. I, p. 379.

Syd., p. 416, on bark of *Ficus glomerata*, Pusa. I collected specimens

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with exactly the same characters in Rio Grande do Sul. Type from Guadeloupe.

Hypoxylon rubiginosum, (Pers.), Fr. Syll. I, p. 376.

Syd., 416, on wood, Kasauli; Dehra Dun; on Bambusa, Chittagong; on palm-trunk, Poona; on bark of Dalbergia, Sissoó, Pusa.—This European species was also found in N. America, S. America, Cuba, Ceylon, Java and Algeria.

Hypoxylon indicum, Syd., p. 416.

On branches, Pusa.

Daldinia concentrica, (Bolt.), Ces et D. N. Syll. I, p. 393.

Theissen, F. Bombayenses., p. 159, on trunks, Andheri; Syd., p. 417, on wood, Dehra Dun; Nagpur; Ootacamund, Nilgiris; Bulsar, Bombay Presidency; Cherrapoonji, Assam; Bilin, Burma; Pusa; Darbhanga pr. Pusa; P. Henn., F. Indiæ orient. II (Hedwigia 1901, p. 339), Saharanpur Garden.—Known also from Europe, Siberia, N. and S. America, Ceylon, Borneo, Tasmania, New Zealand.

Daldinia vernicosa, (Schw.), Ces. Syll. I, p. 394.

On wood, Europe, N. America, Algeria, Cuba, India.

Daldinia Gollani, P. Henn. Syll. XVII, p. 617.

P. Henn., F. Indiæ orient. II, p. 339, Siwalik Range, on rotten wood of *Ficus Carica*.

Kretzschmaria Heliscus, (Mont.) Mass. Syll. XVI, p. 449.

Syn.: *Poronia Heliscus*, Mot. Syll. I, p. 349.

On dead bark, Bot. Garden, Singapore.—Type from South America.

Kretzschmaria Kurziana. (Curr.), Cooke Syll. IX, p. 567.

Syn.: *Xylaria Kurziana*, Curr.

Grevill. XII, p. 3, on the ground, Calcutta.

Poronia Oedipus, Mont. Syll. I, p. 349.

Grevill. V, p. 16, on dung; Syd., p. 420, on horse dung, Pusa; known also from N. America, Java, Borneo, Australia.

P. Henn., F. Indiæ orient. II, p. 240, on horse dung, Saharanpur Garden.

Poronia arenaria, Syd., p. 420.

Under *Casuarina* trees, Chatrapur, Madras Presidency.

Poronia polyporoides, P. Henn. Syll. XVII, p. 620.

F. Indiæ orient. II, p. 340, on dead trunks and on the ground, Saharanpur Garden.

Camillea bacillum, Mont., Syll. I, p. 347.

Theissen, F. Bombayenses, p. 159, on bark, Khandala. Type from S. America.

Ustulina maxima. (Hall.) Schröt. Syll. I, p. 351.

Syn.: *Ustulina vulgaris*, Tul.

Hypoxylon ustulatum, Bull.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sphaeria deusta, Hoffm.

Sphaeria versipellis, Tode.

P. Henn., F. Indiæ orient. II, p. 339, Saharanpur Garden.—Known also from Europe, N. and S. America, Cuba, Ceylon.

Ustulina tessulata, (Berk.) Cooke, Syll. IX, p. 542.

Grevill. XII, p. 3, on wood, Bombay.

Xylaria allantoidea, Berk, Syll. I, p. 314.

Syd., p. 417, on wood, Wahjain, Assam.—Known also from Brazil, Cuba Borneo, Ceylon. P. Hemmings, F. Indiæ orient. II, p. 340 mentions also *Xylaria obtusissima* (Berk.) Sacc. on dead stems, Saharanpur Garden; this species, if correctly determined, is identical with *allantoidea* (cfr. Theissen, Xylariaceæ austro-brasil., Denkschr. Acad., Vienna, 1910, p. 57, and Beit. Bot. Centralbl. 1910, p. 366).

Xylaria regalis, Cooke, Syll. IX, p. 530.

Grevill. XI, p. 86, on wood, Bot. Garden, Calcutta; perhaps merely a form of *X. plebeja* Ces. (cfr. Theissen l. cit., p. 58).

Xylaria plebeja, Ces. Syll. I, p. 318.

Syd. p. 420, on wood, Pusa. *Xylaria fistuca*, Berk.

Syll. I, p. 313, from Nepal is the same species (cfr. Theissen ll. cit.)

Xylaria salmonicoior, Berk, Syll. IX, p. 529.

On wood, Neilgherries.

[**Xylaria furcellata,** Berk, Syll. IX, p. 537.]

Grevill. XI, p. 88, Neilgherries. This species cannot be maintained, because quite undeveloped.

Xylaria dealbata, B. et Br. Syll. I, p. 323.

Theissen, F. Bombayenses, p. 159, Khandala, 4.

Xylaria Thyrsus (Berk). Sacc. Syll. I, p. 320.

On wood, Calcutta.—Known also from Brazil (cfr. Theissen ll. cit.).

Xylaria deserticola, Speg. Syll. XVII, p. 629.

Syd., p. 417, on roots of *Ficus*, Fraserpet, Coorg; on rotten wood, Pusa. Having identified Sydow's specimens myself, I could not find the slightest difference between his from India and my own from Brazil.

Xylaria involuta, Kl. Syll. I, p. 324.

On wood, Kala Panee; Khasia; [Ceylon; S. Amerika; Australia; New Zealand]. This species was described under various names from all tropical regions [*X. Telfairii, gigantea, tabacina, ventricosa*, etc.—cfr. Theissen ll. cit.]

[**Xylaria compuncta,** (Jungh.) Berk. Syll. I, p. 325.]

Reported from Khasia; also from Ceylon, Java. This species probably belongs to the *Hypocreaceas*.

Xylaria Gomphus, Fr. Syll. I, p. 316.

P. Henn. F. Indiæ or. II, p. 340, Saharanpur Garden in a subterranean cellar. Identical with the above mentioned *X. involuta* (cfr. Theissen l. cit.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Xylaria Hypoxylon, (L.) Grev. Syll. I, p. 333.

P. Henn. l. cit., Saharanpur Garden; Syd., p. 418, Solebili. Balehonnur and Bargnai, Mysore. The species occurs all over the world (cfr. Theissen ll. cit).

Xylaria aristata, Mont. Syll. I, p. 333.

Grevill. VIII, p. 96, Belgaum—Known also from Central America, South America and Borneo.

Xylaria Delitschii, Auersw. Syll. I, p. 336.

P. Henn. F. Indiæ or. II, p. 340, Saharanpur Garden. It is very doubtful whether the identification of this species, which is only known from Germany, is correct.

Xylaria digitata, (L.) Grev. Syll. I, p. 339.

P. Henn. l. cit. Mussoorie, Arnigadh—Known from Europe, Africa, North and South America, Java, Ceylon.

Xylaria pistillaris, (P. Henn.) Theiss.

Syn.: *Hypoxylon pistillare*, P. Henn. Syll. XVI, p. 446.

Syd., p. 416, on bark, Bargnai, Mysore.

[**Xylaria Carteri,** Berk. Grevill. XI, p. 88.]

Syn.: *Hypoxylon Carteri*, Berk. Syll. IX, p. 545.

On wood, Bombay.—Belongs to *Xylaria obovata*, Berk. (Cfr. Theissen, *Xylariaceæ*, p. 34.)

Xylaria scopiformis, Mont. Syll. 1, p. 340.

Grevill. VIII, p. 96, Belgaum.—This species is only a form of the following:

Xylaria tuberosa (Pers.), Cke. Syll. IX, p. 537.

Syd., p. 420, on rotten wood, Bargnai, Mysore.—Type from the Sandwich Islands. On this species cfr. Theissen, *Xylariaceæ*, p. 8.

[**Xylaria escharoidea** (Berk.), Sacc. Syll. I, p. 316.]

Grevill. VIII, p. 96, Belgaum.—Type from Ceylon. Cfr. *Xylaria nigripes*.

Xylaria Emerici, Berk. Syll. IX, p. 528.

Grevill. XI, p. 86, Neilgherries.

Xylaria trichopoda, Penz. et Sacc. Syll. XVII, p. 633.

Syd., p. 420, Dehra Dun.—Type from Java.

Xylaria excelsa, Syd., p. 418.

On the ground (?), Narsinghpur, Central Provinces.

Xylaria heloidea, Penz. et Sacc.

Syd., p. 418, on branches, capsules and leaves of *Cedrela Toonæ*, Dehra Dun.—Type from Java; known also from Brazil. (Cfr. Theissen, *Xylariaceæ* . cit.)

Xylaria euglossa, Fr. Syll. I, p. 324.

Syd., p. 418, on dead wood of *Tamarindus indica*, Surat District, Bombay Presidency; on wood, Botanical Garden, Calcutta.—Type from Costarica; as *Xylaria turgida* from the Nicobar Islands; as *Xylaria*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

australis from Australia; also common in Brazil. (Cfr. Theissen, *Xylariaceæ*, p. 57.)

Xylaria hypsipoda, Mass. Syll. XVI, p. 442.

On dead leaves, Singapore.

Xylaria Ridleyi, Mass. Syll. XVI, p. 443.

On dead wood, Botanical Garden, Singapore.

Xylaria aspera, Mass. Syll. XVI, p. 444.

On rotten wood, Selangor.

Xylaria nigripes, Kl. Syll. IX, p. 527.

Syd., p. 419, on the ground, Dehra Dun; Koppa, Mysore; Jullundur; Pusa; Dhulia, Bombay Presidency. *Xylaria peperomioides*, P. Henn., reported by Hennings (F. Indiæ Orient. II, p. 340; Syll. XVII, p. 622) from Saharanpur, is the same species (Cfr. Syd. l. cit.); other synonyms are: *Xylaria Gardneri*, *Xylaria escharoidea*, Berk., *Xylaria piperiformis*, *Xylaria mutabilis*, *Xylaria flagelliformis*.—Known from East India, Ceylon, Java, South America.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MORE BIRD NOTES BY THE WAY IN KASHMIR.

BY

LT.-COL. H. A. F. MAGRATH.

The following notes are supplementary to and in amplification of "Bird Notes by the Way in Kashmir" published in Vol. XXI, No. 2, of this journal. In these latter I expressed the hope of being able to revisit my leave haunts, of last year, in the breeding season. That wish has been partly gratified for I reached Sonemurg this year (1912) during the second week in June. Hopes and anticipations with which I set out to ornithologize on arrival were on the whole, I must confess, not realized, and no startling discoveries fell to my lot.

Sonemurg, with which locality these notes are mainly concerned, lies at an elevation of 9,000 feet and over, is well in the interior of the Himalayan region, and consequently is practically under snow till the middle of May, and it surprised me therefore to find the breeding season already well advanced when I arrived there. Many species had young, well feathered, in the nests, and of some species these were on the wing.

References in these notes are to the above named publication except where otherwise stated.

On the Jhelum Valley cartroad near Dulai at an elevation of barely 2,000 feet I passed a midday, the 29th of August, a flock of young Jackdaws, *C. monedula*, with bills wide agape feeding on the roadway. At this time of year in the narrow gorges, through which the Jhelum flows at this spot, the temperature of the air, owing to the confined space and to radiation from the rocky surroundings, may be anything, from 120 Fahr. and upwards, at midday, and bears comparison with the conditions obtaining at the same season in Dera Ismail Khan or Jacobabad. Yet at this same moment similar flocks of young daws were disporting themselves in the cool breezes of Sonemurg, 150 miles to the north-east. Truly the vagaries of individuals of a species as regards distribution and relative temperatures are wonderful.

The Chough, *Graculus erimeta*, is supposed to derive its name from its note. But the note is much more like the syllables "Chee-o kah" pitched high and squeaky. There is also the common note like "Khew" which has been recorded of this species in England. The young after leaving the nest and when clamouring to be fed make a loud plaintive squeaky mewing note.

The Himalayan Whistling Thrush, *Myiophoneus temmincki*, often utters its loud whistling song when on the wing.

Nests of the Kashmir Wrens, *Anorthura nepalensis*, found at Sonemurg were all built in holes in birch trees, one nearly 10 feet from the ground.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A large brown Warbler with a long bill seen at Sonemurg on August the 9th among the dwarf elders and rank weedy growth on the flat ground across the Sind river, where it had a concealed brood of fledglings, was (I feel safe in identifying it as such in spite of its resemblance to some of the *Acrocephali*, and especially as a nest of the species was taken in this very spot a few years ago by Colonel K. Buchanan). "The Large-billed Bush Warbler" *Tribura major*. This Warbler when imagining its young in danger clings to the top of a tall plant to survey the intruder, and utters a loud alarm note, which, if a double "r" could be added to the sound, would be exactly reproduced by the knocking together of 2 large pebbles.

The similarity in habits between Pallas' Willow Warbler, *Phylloscopus proregulus*, and the Goldcrest, *Regulus cristatus*, is very marked. Both flutter in the same manner at the ends of fir branchlets when picking insects therefrom. But the Goldcrest perhaps creeps more and hunts less on the wing than the Warbler. From the latter he is, from below, most easily distinguished by his beady black eye set in the plain greyish white expanse of the side of the head and cheek.

Nests of the Sooty Flycatcher, *Hemichelidon sibirica*, in Sonemurg were beautifully neat little structures of moss and cobwebs lined with goats' hair. All were placed *on* branches. Some near the trunk, others well out on the branch. Some were high up near the tops of the trees, others only 20 feet or so from the ground. The Birch, the Sycamore, the Bird Cherry, and the Himalayan Silver Fir all seemed to be equally selected as nesting sites.

The Rufous-tailed Flycatcher, *Alseonax ruficaudus*, has a loud melodious song. Some of the notes indeed are remarkably loud for the size of the bird. The song is not continuous but consists of warbles and whistles interrupted by the bird's flittings to catch a fly, or pick an insect off a leaf, the stem of a tree, or, rarely, from the ground. Some notes closely resemble those of the Indian Blue Chat, *Larvivora brunnea*. A characteristic part of the song may be syllabified as "Tyee-trrirr, trrirr tee." Amongst others notes frequently heard sound like "Weetititew," "Ee-willu willu" and "Choi choi." Occasionally there is a loud finch-like "Twoink twoink". All notes are rapidly repeated. While singing the male rarely stays for more than a few seconds in one spot and as he prefers a leafy tree, for choice the Birch, *Betula utilis*, and is at the best of times not a conspicuous bird, coupled with the exasperatingly ventriloquial character of the song, he is exceedingly hard to pick up and follow by eye. Indeed during the breeding season this Flycatcher but for its loud song may be considered to be of a retiring disposition. The male is a hopeless guide to follow in search for nest and eggs. He wanders over a large area of open forest while singing and at times may be found thus, perhaps 300 or 400 yards from the nest.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Days and hours spent by me in searching for a nest met with no success. I came to the conclusion that this Flycatcher must have been breeding high up in the silver firs, *Abies webbiana*, than which trees none are more difficult to spot the nests of small and inconspicuous birds in. But one day long after I had ceased to devote exclusive attention to these birds, my woodcutter coolie, who had orders to report any nests he found, informed me that he had found one of sorts. Proceeding to the spot I saw a small nest from which the young had evidently flown, situated about 10 feet from the ground in the fork of a branch of a small silver fir in forest. Built of moss and grass, it was deep and cup-shaped, and densely lined with feathers. My knowledge of the birds of the locality combined with a process of elimination and, above all, reference to a published description of nests of the present species (Stuart Baker, Ibis Vol. VI., No. 22, p. 279) with which it tallied, led me to the conclusion that I had at last, only too late, found what I had so long sought.

As remarked (*ibid*) the Rufous-tailed Flycatcher does not make sallies from a selected perch when capturing its prey, but flits from branch to branch. In disposition it is pregnacious, chasing away other small birds that come near it. Especially intolerant does it seem of the Himalayan tree-creeper, *Certhia himalayana*. It was not numerous in Sonemurg and pairs did not breed near each other as in the case of *H. sibirica*.

Like Mr. S. L. Whymper I too found a tree nest of the Plumbeous Redstart, *Rhyacornis fuliginosis*. This was over 20 feet up, and built in a crevice in the stem of a silver fir.

The Red-flanked Bush Robin, *Ianthia rufilata*, is to the nest hunter in these forests what the Ruddy Sheldrake is to the Duck Shooter on our Indian Rivers, namely, an unmitigated nuisance, for its loud harsh scolding or alarm note puts every little bird within 100 yards radius on the *qui-vive* and all come to see the trouble and take warning accordingly.

In different localities songs of males of the same species differ, and often to a considerable extent. For instance up the Sind Valley, at about 7,000 feet, the song of Tickell's Ouzel, *Merula unicolor*, which, in the Kashmir Vale below, is a monotonous repetition of a few notes, was here much more varied and melodious. So much was this the case that on occasions I was led to stalk a singing Thrush not recognising it from the song. In every case it proved to be of the present species.

The low pitched musical call note "Tew" followed by a quickly repeated "Tewtya" is quite characteristic of "The Orange Bullfinch," *Phyrulla aurantiaca*, and will, even midst a variety of forest sounds, always indicate the presence of this bird. By imitating the note it is not difficult to bring the bird into one's immediate presence. I used often to call a male into a tree by my tent, where he would sit and sing lustily, and I once called him down on to my tent ropes. The song as mentioned (*ibid*) sounds "metallic," but

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

it may be still better described as consisting of a series of very rapidly repeated low flute like notes. No two males sing quite alike, although the pitch or tone is the same in every case. For my own edification I syllabified many variations of the song, and so well acquainted did I become with pairs of these birds that I was able to differentiate between them on hearing the male sing. The impression received from the song of the male, mentioned above, when not heard too close, may be well conveyed to the ear by a rapid repetition of the words " Give the devil his due"—" Divil a bit. "—This uncharitable sentiment, let us hope, was not really endorsed by the bird !

The staple food in summer appears to be buds and catkins of the Himalayan Birch (ibid), but early in the season it was not uncommon to see pairs hopping about on snow patches in forest picking up minute seeds left on the surface of the melting snow. A curious feeding habit late in summer was the pecking and swallowing of mouthfuls of a very fine grained dry yellow clay which filled in the archways of the roots and the hollow bases of individual old silver Fir trees. Within four yards of me I watched a pair gorge themselves on this stuff for fully ten minutes and then fly away down hill to where I suspected there was a nest but which I never found. If such there was then this nesting was well below 9,000 feet. The clay in question probably contained food properties essential to the young which were doubtless fed on it by regurgitation. A rough analysis however failed to reveal any seeds, insects, or grit and to the taste it was insipid.

I spent many days in forest and on hill side at various elevations searching for the nest. Colonel Ward's description of the locality in which his collectors took these puzzled me considerably for it was only between 9,000 and 10,000 feet, rarely over, that I could be sure of meeting with this species. Above 10,500 feet there was never a sign of the birds. They were in fact left below. This was my experience both in the Liddar and Sind valleys (ibid). I have little hesitation therefore in asserting that 11,000 feet is the maximum elevation at which the Orange Bullfinch will be found in Kashmir. A very short acquaintance too with its habits suffices to shew that like its European congener it is a woodland species. Searching for nests therefore on open bush clad hillsides at 12,000 feet and over which is above the tree limit in these parts, was anything but profitable and I soon abandoned it to confine my attentions to the forests below frequented by the birds. My reward eventually followed in the discovery of a nest on 28th July.

On the 27th I observed a pair of Bullfinches in a strip of forest at a spot just about 10,000 feet above sea level. The action of the female clearly indicated that she contemplated domesticity. But after hopping about in the lower branches of a silver fir and occasionally giving a half-hearted tug at a twig or piece of lichen she and her mate, to my chagrin at the time, disappeared into the forest, and although the notes sounded at intervals did

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

not return to the spot. Determining to watch the place, however, I returned there next day and was gratified on arrival to see the flash of two white rumps as a pair of Bullfinches startled from the ground simultaneously disappeared into a thick tree. A few moments and they were back again, and to my delight the female picked up a twig and flew behind the trunks of some silver firs. Shifting my position, so as to watch the direction of her flight, I saw her return, pick up another twig, and dive with it into a low, tangled, and drooping branch of a medium sized silver fir. For some time I watched through glasses the process of building. Twigs were the only material used during my vigil. It was interesting to watch the manœuvres to get an extra long one into position. This would be first pushed into the branch by one end while she, going round to the nest side, would from there pull it through and deftly weave it into place. Not

The cross marks site of nest of Orange Bullfinch (*P. Aurantiaca*)—nest about 6 feet from ground.

daring to go nearer for fear of disturbing the pair I left the spot quietly, deciding to return a week later when I hoped the full clutch would be laid.

On the 4th of August, accompanied by Colonel K. Buchanan, I revisited the spot. We found the female on the nest and sitting very close. Three people walking about immediately below did not disturb her and it was not till I almost had my hand on her that she flew off. My astonishment was considerable therefore on examining the nest to find only one egg and that fresh! The situation was puzzling but on Buchanan's advice the nest was left till the 8th August. On arrival at the nest on this date the female was not "on" but appeared a moment or two later with the male and at once flew to the nest. She sat for half an hour or more when the male, returning, called her off. Being satisfied that she was sitting in earnest this time I took the nest and the 3 eggs which it

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

contained. While removing these both birds reappeared close above me uttering the 'tewtya' note.

The eggs were blunt ovals measuring about ·75×·56 and in other respects were more or less similar to those described by Colonel Ward, mine being white fairly densely speckled with reddish brown with superimposed purplish brown spots in a zone round the larger end. The shells were somewhat fragile, smooth, and fine grained in texture.

The nest though smaller was not unlike that of 'The European Bullfinch.' A platform of twigs on which was built a shallow cup of fine rootlets and a little dried grass. A few goat hairs completed the lining.

The close sitting of the female on the 4th August was decidedly strange. She could hardly have been incubating, for although some birds are known to commence this from the laying of the first egg, notably species that lay early in the year and in exposed situations, the Bullfinches are not of this group. I can recall too the fact that on this date she was not sitting down into the nest as she was on 8th August when only the top of her head was visible to one standing by it. The only explanation of her behaviour on the 4th that occurs to me is that she was in the act of laying as we arrived. This was about 8-30 a.m. As she was not kept more than quarter of an hour off the nest on this occasion I am inclined to be sanguine that she had time to get back to lay her egg and did not drop it outside in her extremity.

August nests must, I imagine, be second broods. From the second week in June, when I first met with these Bullfinches, they were always in pairs and the males singing vigorously. Moreover in the beginning of August I came across parties of 3 or more. One party was for certain a pair with 1 young. This latter had been out of the nest for some time as it was exactly like the female and the male kept hunting it away when it persisted in following him. It was not till June the 28th that I first saw signs of nesting when I observed a female with a twig in her bill, but as she flew far away with it I never succeeded in locating the nest.

Like the European Bullfinch, this species is secretive at nesting time only, choosing for the nesting site the quietest and remotest corner of a wood within the limits of elevations given. As far as I could gather the densest portion is not selected, but parts more or less on the level are preferred.

The Orange Bullfinch is a charming little bird in every way. The affection with which the male treats his partner is quite pretty to watch. Rarely does he let her out of his sight, and while she feeds, drinks, or bathes he is never more than a yard or two away seemingly too utterly absorbed in admiration of her charms, to follow suit, and constantly bursting into his melodious little song. While *she* builds the nest *he* sits on a twig close by, now and again looking to see how the work is progressing,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

though never, I fear helping, and occasionally hopping up to give her a kiss by way of encouragement.

That these Bullfinches pair for life is I imagine more than probable.

The Rose Finch, *Carpodacus erythrinus*, was fairly numerous in Sonemurg up to the beginning of July. It doubtless nested there, and at no great elevation either.

I must qualify the statement (ibid) regarding the partiality of the Red browed Finch, *Callacanthis burtoni*, for dark forest situations. This is only partly correct. Although essentially a woodland species and, when actually nesting, a forest bird, yet when the young are fledged, it often ventures into open situations, though never away from the vicinity of trees. Much of its time is spent in searching for food on the ground. It is a wonderfully tame species and often in the early morning a family party would peck for food round the door of one's tent.

Contrary to the impression received last year I find these birds to be early breeders. Fully fledged young were on the wing by the 3rd week in June if not before. The young have the head uniform brown and show no coloured brow or supercilium. There is little doubt that two broods are usual, though I failed to observe a nest.

The common note of this species (ibid) may perhaps on a close acquaintanceship, be better rendered by the syllable 'Pweee'*. This is often followed by notes like 'Pweu' 'Pweueu' or 'Chipeweu'. The 'eu' pronounced as in the French. All notes are plaintive and melodious.

The Himalayan Goldfinch (*Carduelis caniceps*) nested commonly in isolated fir trees about the "Murg" and young were fully fledged by the third week in July. The young have the head uniform grey brown, the red and black mask of the adult probably not being assumed till after the autumn moult. It was a pretty and familiar sight to see flock of "Goldies" flying about the "Murg" fluttering at the thistle and dandelion heads. But only a short time do they stay at the nesting elevation, and by the end of July most have left for the lower valleys. The notes do not differ from those of the European Goldfinch.

---

* It might be imagined that the conformation of a bird's vocal organs, *viz.*, syrinx, palate and bill, would preclude the possibility of its producing any sound commencing with the letter 'P' as made by human lips, but it is remarkable how often bird's notes can only be correctly reproduced by syllables commencing with this letter. As regards the present species this is very much the case. I have listened to the notes at a distance of 3 yards only and no other initial letter in the syllable could so well convey the sound to the human ear. It may be that in the vocal apparatus of some birds an action, analogous to that of human lips when pronouncing the letter 'P' takes place when air, in giving utterance to a note, is expelled through the syrinx, the contiguous surfaces of the back of the tongue and the soft parts of the palate taking the place of lips.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

On the 10th of June at Gund, 14 miles below Sonemarg in the Sind Valley, I saw large flocks of Gold-fronted Finches (*Metaponia pusilla*) on the open hillsides. This finch, like "Stoliczkas," seems to keep in flocks throughout the breeding season. The call-note is a twice quickly-repeated note like 'chup'. It did not occur in Sonemarg.

The 39 miles of cart road running through the rice fields of the Vale of Kashmir from Baramulla to Srinagar is bordered on either hand by a monotonous row of tall poplars planted close together. In the breeding season every third or fourth poplar holds a nest (bulky, untidy structures of grass), some hold four or more. These are nests of the migratory sparrow (*Passer domesticus*) mentioned (*ibid*). The number of nests along this stretch must run nto thousands. But this is only a very small portion of the breeding area of this sparrow in Kashmir. The origin of the vast hordes of sparrows, which descend upon the cornfields of North-West India during the spring passage and hurry through to Central India in autumn, is thus partly revealed. If not a blessing in disguise to the Kashmiri zemindar (as it is a curse and curse only to the farmer of the plains of North-West India) this sparrow at any rate compensates him for any damage done to the rice crops later in the summer by the prodigious quantities of green caterpillars which it destroys to supply the needs of the young in the nest.

Breeding, as described, along a roadway on which there is a considerable traffic, these birds are afforded protection to a great extent from their natural enemy the Sparrow Hawk (*Accipits nisus*). But they have one enemy which *nests* among them and has no fear of the traffic, namely, the Rufous-backed Shrike (*Lanius erythronotus*). That this shrike takes a heavy toll of the sparrows in the shape of young is pretty certain. Indeed, I believe the Rufous-backed shrike to be somewhat addicted to sparrow fare, as wherever sparrows occur in numbers either nesting or roosting, in this part of India, this shrike is pretty sure to be common. A good illustration of its propensities in this respect was afforded me one November afternoon while standing in the club verandah at Nowshera. Over the porchway was a heavy creeper in which sparrows roosted in numbers. While these were noisily settling down for the night a shrike of the above species darted in, took a sparrow, and flew with it to a small tree a few yards away. The fortunate observers of this incident attracted others to the scene, and the strange spectacle was witnessed of a shrike breaking up and devouring his quarry while perched on a small branch some 6 feet or so above the head of the big drummer of the band of an Indian regiment which was playing at the time on the club lawn. Evidently this particular shrike appreciated music at his meals.

Nesting colonies of the above migratory race of *P. domesticus* also occur in Peshawar. In remote corners of this district away from villages n

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

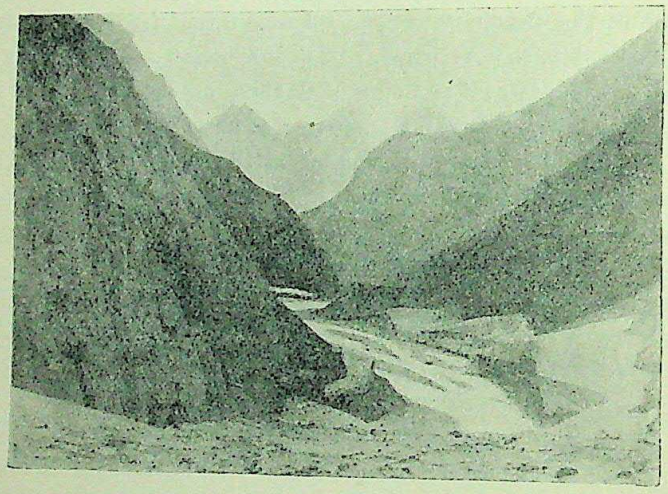
Digitized by Arya Samaj Foundation Chennai and eGangotri

small jungles and rukhs I have found tamarind thorn trees full of such nests.

A curious instance of a double nest was that of an Eastern Meadow Bunting (*Emberiza strachei*) which had built, under a stone, two nests along side of one another. One of these was empty, the other contained four young.

The Crested Bunting (*Emberiza melanicterus*) was quite common on the Murree-Srinagar tonga road between Dulai and Uri. The bird was often to be seen singing perched on the telegraph wires.

In company with a few Snow Pigeons (*Columba leuconya*) which had their nests in holes in the limestone rocks of the famous pilgrims cave of Amarnath (13,000 feet) was a small colony of Kashmir House Martins (*Chelidon kashmiriensis.*) A further instance of the desolate wild and



AMARNATH VALLEY (13,000), where the famous pilgrims cave is and in which the Kashmir Martin (*C. kashmirensis*) was found breeding. The bottom of the valley is all snow. Taken Aug. 16.

elevated regions to which these Martins resort for breeding purposes in some parts of their range.

On the 30th June a friend, when descending a hill above Sonemarg, disturbed a bird nesting on the ground at about 11,000 feet. The nest contained four eggs which he described as dull whitish in colour and fairly densely speckled with brownish purple. Two days later we visited the spot together and found the eggs hatched and four young in the nest. I watched the female on to the nest and got a close view of her through glasses. From the broad bold streaks on the breast, the comparatively small amount of white visible in the tail in flight and the light flesh coloured legs I

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

feel sure that the bird was the European Tree Pipit (*Anthus trivialis,*) which was so common here last year at the end of August. The nest was in a hollow under a sod on the hillside and was built of dried grasses. It was situated within 20 yards of a small clump of birches into which the parent bird always flew on being disturbed.

A nest of Hodgson's Pipit (*A. rosaceus*) containing four eggs, which I found four days later about 1,500 feet above on the ridge, and under a stone, was composed of exactly similar material.

The Long-billed Horned Lark (*Otocorys longirostris*) when disturbed, rarely takes flight immediately, but runs in front of one with a slight waddling gait which reminds one of a minature chikor. This lark was fairly common on open grassy hilltops at 14,000 feet and over.

The Cuckoo (*Cuculus canorus*) occurred, but was rare, in Sonemarg. The last date on which the call was recorded by me was July the 18th.

I failed to discover—and not for want of searching—the author of a very loud monosyllabic note which was uttered twice comparatively slowly and then three or four times rapidly, the whole being repeated several times with an attempt at rhythm. I first heard it about 14 miles below Sonemarg in the Sind Valley late in the afternoon and again the following morning. At Sonemarg it appeared to be uttered at night only usually between 2 and 4 a.m. My first impression was that it was a note of some Laughing Thursh with which I was unacquainted. But not having met with any birds of this genus, I eventually abandoned this idea and came to the conclusion that the Large Barred Owlet (*Glaucidium cuculoides*) must be the author of the sound. The note could be heard some hundreds of yards away, but was exceedingly difficult to locate.

Scully's Wood Owl (*Syrnium biddulphi*) was the common owl in Sonemarg. Indeed this was the only owl I met with. It was often to be seen perched at the entrance to a large hole in some gnarled old sycamore in forest. Some of these holes, especially those under which I found pellets, were searched, but failed to reveal a nest in being. As I did not come across the bird till after the middle of June the young may have flown, but I have little doubt that it was in such situations they nested.

About an hour before dark this owl wakes up and gives its quadruple cry—a loud "Hoo—Hoot tu whooo," an impressive sound at dusk in these high Himalayan forests. The pause after the first syllable is very marked.

Only occasionally in the breeding season was the 'hoot' given during the actual hours of darkness, but with a waning moon it was often to be heard an hour or so before dawn. Later on in the summer the young owls were often very noisy at night. For some days, whenever an owl, which haunted a bit of wood close to my camp, uttered its note at dusk it was immediately answered by another in a slightly higher key. At times the two hoots would sound simultaneously and whenever this happened the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

higher-pitched note invariably upset the cadence of the lower, the effect being quite ludicrous. Whether this was a rival, a mate, or a young "Scully" getting his first singing lessons I never discovered. When flying about at night a note repeatedly uttered by these owls sounded like "Khawak."

From an examination of the disgorged pellets it appeared that the principal food in the breeding season consists of small rodents of the *Micromys* and *microtus* genera which abound in these forests. Occasional pellets showed bits of the wing cases (*elytra*) of beetles. I saw no remains of birds. One method of hunting at dusk is as follows:—The owl flits silently to the horizontal trunk of a birch or other tree (at these elevations, 9,000 ft. and over, trees on any slope, owing to the pressure of snow in winter issue horizontally from the soil before they curve up vertically) under which it has marked down the hole of a mouse or vole and there remains motionless. As the little rodent cautiously creeps forth in search of food there is a swift pounce and the owl gets the *entrée* of his supper.

Some writers on Natural History affirm that the "Hoot" of an owl is a hunting cry which they suppose terrifies small birds and mammals into movement so enabling the owl to locate and swoop on them. In the case of the present species the cry, by twilight at any rate, was certainly not used for this purpose for it was generally uttered from the top of a high fir tree on rising ground and repeated often for ten minutes at a time.

Like most members of the family pairs of these owls have their own hunting preserves into which no other individuals of the species are permitted to enter. Three separate patches of forest around Sonemarg each held its own pair of Scully's Wood Owls.

The graceful flight and hover of the Kestrel (*Tinnunculus alaudarius*) was occasionally to be seen over the "Murg." Twice I observed a Kestrel stoop at and give chase to small birds in best approved peregrine style. On the first occasion the quarry was a Grey Wagtail (*Motacilla melanope*) at which constant deadly stoops were made, the wagtail only just escaping by flying into a fir tree. The second instance was the stooping at and chasing of a flock of Stoliczkas Mountain Finches, but in this case it was probably play only.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PROGRESS OF THE MAMMAL SURVEY.

Since July, when the last editorial note on the progress of the Mammal Survey appeared, work has only been proceeding slowly. This is inevitable in India where, owing to the rainy season prevailing from June to September inclusive, it is almost impossible for field work to continue during these months.

Mr. Crump left Chanda, C. P., in July when the rains set in and returned to Bombay. He is now in Kathiawar and will afterwards probably work Guzerat or Rajputana.

Mr. Shortridge after leaving Shimoga made an expedition to Bellary District where at Humpi (the ancient city of Vijayanagar) he camped and collected vigorously for some weeks. He obtained some 331 specimens there, and the old ruins and temples contained a large number of bats. From Humpi he proceeded to Bangalore and from there to Kolar in the east of Mysore State. He has just left that for Cauvery (Seringapatam) and Mysore after which he goes to Coorg and the West Coast—where the rains will then be over—on his way to the Nilgiris and S. India.

The Committee hope that members residing in districts visited by the Mammal Survey collectors will send in specimens of any animals of which only one or two or no specimens have been obtained by the collectors.

In the Nimar report (p. 844, No. 3, Vol. XXI) it will be seen that very few skins were collected of certain animals and it is most desirable that further specimens should be procured, more especially of the Langur, the Deccan Spiny Mouse and Phillips' Spiny Mouse. Also a considerable number of species, which are almost certain to occur in the district, do not appear in the report as having been obtained by the collector and to make up these deficiencies the Society will be glad to obtain skins and skulls of the Bengal monkey, the smaller bats, flying squirrels, Bandicoot rats, Blanford's rat, porcupine, four-horned antelope, mouse deer, pigs, &c. Though no specimens of the Tree-Shrew (*Tupaia*) were caught either in this district or the Berars (*vide* report, p. 820, No. 3, Vol. XXI) it is in all probability to be found and skins are much wanted. The report on the Dharwar collection appearing in this issue is more complete, but nevertheless as will be seen more specimens of certain kinds are wanted and also of the few which although found in the district were not obtained by Mr. Shortridge.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

As our special collectors can only visit a particular district at one time of the year, it will be obvious that it is almost impossible to obtain specimens of *every* animal found in that district—as at one season some animals will be more difficult to procure than at another season—and it is in this way that our members who are residing in that district can help the Society by filling in the blanks.

Skins and skulls from *all* districts of the different kinds of big game are also much desired, more especially so as our collectors do not try to obtain the larger game animals except when opportunity offers

All skins should be accompanied by their skulls and if possible by the following simple measurements; head and body, tail, hind foot and ear, and a label giving locality, sex and date, should be affixed to both skin and skull *which should only be roughly cleaned.**

Besides specimens we should be glad to receive from members any notes on the distribution, habits, local names and folklore of the different animals in their district. It is hoped that members will co-operate and help with this information so that the Mammal Survey may not only result in a collection of properly labelled and worked out specimens showing the species and their distribution in India, Burma and Ceylon, but also in the bringing together of information of all sorts relating to their habits.

As regards finance, members will be glad to learn that we have received valuable help from the Government of Bombay (Rs. 2,500), the Government of the United Provinces (Rs. 2,000), the Government of India (Rs. 7,500) and Mr. Ratan Tata, a second donation (Rs. 1,000) and the total sum obtained and promised now amounts to Rs. 42,992-8-6 whilst up to date we have spent about Rs. 17,877-11-4.

The Committee feel, however, that a third collector is absolutely necessary if the survey is not to be prolonged for several years. The magnitude of the task is becoming more evident as the survey progresses. India, Burma and Ceylon cover such an enormous amount of ground that if the survey is to be thoroughly done, a third collector to start at the southern boundary of Burma to work northwards is extremely desirable at once. It is estimated that a sum of Rs. 15,000 to Rs. 20,000 will be required to bring out a third collector for 2 years to work Burma. The Government

* A pamphlet on the skinning and measuring of large and small mammals can be had from the Honorary Secretary on application.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of India have promised Rs. 7,500 as mentioned above and Mr. Ratan Tata has kindly promised another donation of Rs. 1,000 towards this object *on the understanding that the rest of Rs. 7,500 is obtained and the object carried out.* The Committee therefore hope that the balance may speedily be obtained, so that the provision for the other two collectors may not have to be dipped into.

At the same time it will be noticed that the subscription list this time includes very few members' names and it is earnestly hoped that members will not lose their enthusiasm for the scheme in consequence of some Governments having given the Society a helping hand.

Small annual subscriptions towards the Mammal Survey Fund will be very acceptable as the work cannot be carried through thoroughly unless a good deal more money is forthcoming.

MAMMAL FUND.

FURTHER LIST OF SUBSCRIBERS UP TO 30TH SEPTEMBER 1912.

NAME.	Amount.		
	Rs.	A.	P.
Amount previously acknowledged in Journal No. 3, Vol XXI	27,255	15	0
BOMBAY GOVERNMENT	2,500	0	0
Burke, Capt. H. F.	51	9	6
Evans, Col. G. H.	45	0	0
Fletcher, T. Bainbrigge	50	0	0
Holden, Major H. N.	15	0	0
Howell, E. B.	15	0	0
Milner, C. E.	15	0	0
MADRAS GOVERNMENT	2,500	0	0
O'Donnell, O.	5	0	0
Suter, Dr. M. F. (Rs. 10 per month for June, July, August and September)	40	0	0
UNITED PROVINCES GOVERNMENT	2,000	0	0
Rs. ..	34,492	8	6
For a third Collector.			
Promised by THE GOVERNMENT OF INDIA Rs. 7,500			
" " Mr. Ratan Tata (2nd donation) .. .. " 1,000	8,500	0	0
Total Rs. ..	42,992	8	6

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MISCELLANEOUS NOTES.

No. I.—TIGER (*FELIS TIGRIS*) KILLING AND EATING ITS YOUNG.

I have often wondered how it is that I have seldom found more than two and never more than three cubs with a tigress although on two occasions when I have been so unfortunate as to shoot a pregnant tigress I have found as many as five unborn cubs inside her. Until a short time ago I accounted for this with the theory that possibly the tigress eats some of her cubs soon after they are born—a habit not unknown with other animals I believe.

Recently however I have come to change my views.

On May 20th I had joined camp with Mr. Symes who was shooting in this district. A tiger, a tigress and two cubs were known to be about and the previous night and in the very early morning the rather unusual roar of a tiger was heard for some time. In the direction of the roars a prepared kill had been taken by a tiger and later about a mile beyond this kill a natural kill of a sambur by a tigress was found. We decided to beat over the artificial kill first. The beat was blank the tiger having gone out of the beat beforehand towards the other kill. The beaters however found two dead half-grown tiger cubs in the beat which had clearly died in the evening before.

We examined these dead cubs and found that they had been killed by a male tiger and both of them partially eaten at the haunch. They had both been killed in the same place but one of them had been dragged some hundred and fifty yards from its dead companion. It was interesting to see that the cubs besides being rather severely bitten in the throat had been much clawed in the arm pits, in fact sufficiently so to alone cause their death.

Local natives, who certainly ought to know something about tigers, say that a male tiger will always kill cubs if he comes across them, and after this interesting experience one can well believe it. In this particular case the tigress had probably left her cubs early in the evening and killed the sambur. While she was busy with this the tiger probably came across the cubs on his way down to the water where the kill was. After disposing of the cubs he must have gone for a drink and killed the bait tied up for him. The roars we heard were probably those of the distressed mother and perhaps it was well that she was not in the beat.

Mr. Symes also corroborates the facts of this story.

JAMES W. BEST, I. F. S.

BILASPUR, C. P., *6th July* 1912.

[In Vol. VII. of our Journal (1892), page 253, we published a note by Colonel Scott of Palanpur, on "Tigers eating their young."—EDS.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. II.—CANNIBALISM AMONG PANTHERS (*FELIS PARDUS*).

About a week ago I had three panthers, said to be a large male, a female and a small male, marked down in some dense thorn jungle chiefly candelabra cactus and babul not many miles from Veraval.

The jungle was far too close to beat, so I tied up a live goat and sat over it in a machan about 6 P.M. A medium sized male panther came at 6-30 and I hit him hard with a 500 express bullet. He turned and jumped back into cover, and, on examining the spot, I found a piece of lung on a stone, and a thick trail of light-coloured frothy blood leading into the thick thorn jungle. I knew then that he was hit through the lungs and could not go far, so I decided, as the cover was so thick, to leave him till next morning. In the morning I found him lying about 50 yards away the other side of a thick clump of cactus through which he had dragged himself. Imagine my disgust to find that he had been more than half eaten and the skin of course ruined. The head, chest and forelegs, hindlegs, tail and part of the rump were untouched, the rest of him was eaten, the ribs bitten off close to the spine.

All round were the footmarks of the female and the small male, so there is no doubt that they had made a square meal of their dead relation. There were no signs of jackals or hyenas. The dead panther had very large pads, and this accounted for his being described as a large male though as a fact he was only a medium size.

I remember reading of a similar case in a previous note in our Journal, but I believe such cases to be sufficiently rare to make this one worth noting.

J. R. CARTER, MAJOR,
Bombay Political Department.

CAMP VERAVAL,
7th June 1912.

[Cases of this kind have already been recorded both amongst tigers and panthers in Vol VI. and XVII of this Journal.—EDS.]

No. III.—NUMBER OF A PANTHER'S (*FELIS PARDUS*) CAUDAL VERTEBRÆ.

In my notes in the last number of the Journal on Mr. Hick's book "Forty years among the wild animals of India" I referred to his statement that two species of panther are distinguishable, among other differences, by the 'fact' that the large 'species' has only 22 vertebræ in the tail while

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the smaller has 28. It is of interest therefore to record that in April last in the Mahi Kantha Agency I shot a female panther measuring 6 feet 2 inches (including tail of 2 feet 7 inches) the number of whose caudal vertebræ on careful examination proved to be 24. As a single instance is insufficient to dissipate what I believe to be a myth, it may be hoped that others will be reported by members of the Society.

A. H. MOSSE, CAPTAIN, I.A.

PALANPUR,
23rd *July* 1912.

No. IV.—NOTES ON MARTENS IN KASHMIR.

Toiling up a moraine one afternoon with a friend at Sonemurg and when at an elevation of about 11,000′ he suddenly gave a low whistle from behind me and beckoned me to his side. There not five yards from us appearing from beneath a rock was a fine example of The Beech Marten (*Martes foina*). The animal did not appear much disquieted by our presence, continuing to sniff and gaze around, till one of us made a slight movement when it withdrew beneath the rocks. We waited some time for its reappearance but it evidently decided to stay at home, or had slipped away by a hidden passage beneath the moraine.

Imagining that we had found the entrance to its lair my friend a few days later set up a camera and waited on the chance of securing a photo, but there was no further sign of the Marten, only a few mouse hares appeared from beneath the same rocks and played about. Later on I went up to try my luck with a gun and to endeavour to secure the Marten as a specimen. But I waited in vain and had to contend myself with a mouse hare which came out *at the same spot as the marten had*. The presence of these mouse hares rather upset the theory that we had discovered the Marten's lair, and we came to the conclusion that, when we saw the latter, it was hunting, and had been prospecting the mouse hare burrows under the rocks from beneath which we saw it emerge. It is hardly likely that a Beech Marten and mouse hares would live amicably side by side. The biblical "Lion and lamb" miracle would be quite eclipsed by such a state of affairs.

In the same locality, the Indian Marten (*M. flavigula*) frequented the forests just below.

H. A. F. MAGRATH, LIEUT.-COLONEL.

KASHMIR, *July* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. V.—NOTES ON THE TIME OF APPEARANCE AND FLIGHT OF EASTERN BATS.*

	Time of appearance.	Flight.
Pteropus	early (well before sunset).	High, slow and heavy (rook-like) occasionally soaring for short distances.
Cynopterus (including all other small fruit bats.)	late (well after sunset).	Low, compared with *Pteropus*, comparatively quick and fluttering.
Rhinolophus	late	Low and fluttering.
Hipposiderus (small).	frequently early.	High, although not particularly swift (Java, New Guinea, etc.)
Megadermatidæ ..	very late ..	Low swift fluttering.
Pipistrellus	early	Larger species swift, smaller species (including *Tylonycteris*) very erratic in flight. The larger species generally fly high, the smaller are variable.

[This is true, but I have several times seen them in swarms before sunset when white ants were swarming after first rain—R. C. W.]

Scotophilus	early	High, swift.
Harpyiocephalus! (*Hesperotenus ?*)	early	High, slow and heavy.

[I am not sure of this identification but all specimens entered in lists as *Harpyiocephalus* were *Hesperoptenus*—R. C. W.]

Plecotus	late	Slow and fluttering, comparatively low.
Kerivoula		
Vespertilio		

[Almost certainly Mr. Shortridge means *Myotis*—R. C. W.]

Minopterus	early	High, very swift.
Emballonura ..	early	Erratic in flight. Like that of small *Pipistrellus* high (Java, N. Guinea, &c.)
Taphozous	early	Swift, high.
Rhinopoma	early?	Swift.
Nyctinomus	early	High, very swift (Java, Australia, etc.)

G. C. SHORTRIDGE.

August, 1912.

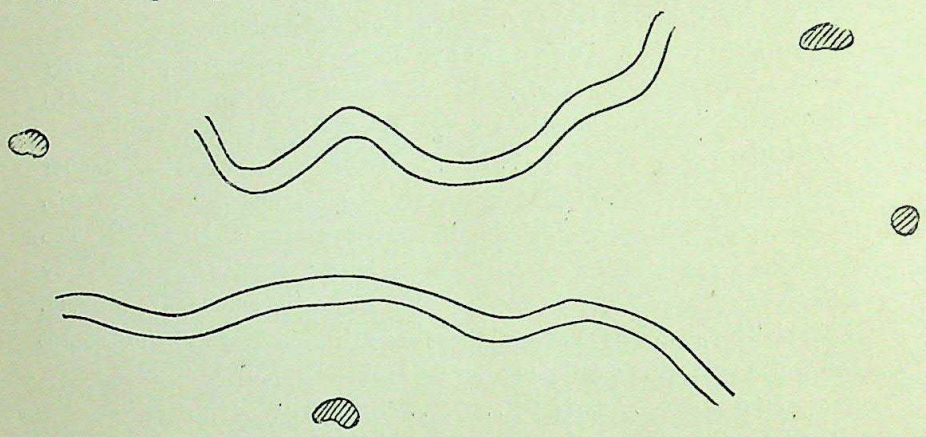
* Mr. Shortridge's notes were submitted to Mr. Wroughton who has added a few remarks in brackets under his initials R. C. W.—EDS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. VI.—THE HABITS OF VOLES.

Where voles of the genus *Microtus* are common in Kashmir and Himalayas, a curious phenomenon is revealed, on the melting of the snow, which covers their burrows in winter, in the long tortuous ridges of clay left lying on the surface of the ground. These ridges, often some yards in length, are *solid* throughout, more or less cylindrical, and from 2 to 3 inches in diameter in section. As often as not they are unconnected at their extremities with the entrance holes of the voles. The rough sketch below will perhaps explain my meaning better than the description, *viz*:—



A friend who had also noticed and taken an interest in these curious ridges informed me that he had once found them in the melting snow on a hillside, *running through the snow and not in contact with the ground though close above it.* This discovery shed some light on what was a perplexing puzzle, and led to the formation in my mind of the following vague theory of their origin, one which however does not altogether satisfy me.

If any of our readers can enlighten me with the true and scientific explanation I shall feel indebted to him or them.

I imagine then that, when their burrows are buried deep in snow, these voles abandon their usual habits of burrowing connecting passages underground (such passages being likely to collapse when the snow melts, and thus to lead to flooding of burrows), and construct instead passages *along the surface of the ground and through the snow.* But, in order that these passages may be kept dry and warm, earth is pushed up into the snow to form a roof above and possibly walls along the same, the earth for this purpose being excavated and brought from the holes, as *no trench is ever apparent under the ridges in question or connecting the holes.* When the snow melts on a slope these ridges can rarely, owing to force of gravity, be deposited on the ground vertically below the position they occupied in the snow, and must therefore often come to rest some little way down hill.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This explains their seeming lack of connection with the holes when found on dry ground. On deposition also the walls, if any, would tend to collapse and quickly assimilate with the surrounding soil.

Whatever the explanation of these mysterious ridges, however, they, at all events, bear silent witness to the activity of these little rodents when their homes are buried deep in winter snows and show that hibernation is not entirely spent in sleep.

KASHMIR, 1912. H. A. F. MAGRATH, Lt.-Col.

No. VII.—THE INDIAN BUFFALO (*BUBALUS BUBALIS*).

In the Bellary Gazetteer published in 1904, attention is drawn to the fact that "Many of the buffaloes in the district are peculiar in having a white patch between their horns." I have noticed that this is also of frequent occurrence in the North Kanara, Mysore and Dharwar districts, the white varying in size from a small patch, to the whole forehead; more rarely extending over the face. Another curious form not uncommonly observed is that in which the eyes are of a clear, almost China-blue instead of the usual dark brown.

In Blanford's "Fauna of British India" the only mention of any colour variety of the domesticated buffalo is "that the legs are occasionally white to the same height as in the Gaur," while the fact is noted that few of any animals have changed less in captivity than the Indian buffalo.

It would be interesting to know if this variety with the white forehead is peculiar to the south, or whether it is found throughout India.

Any one who has been in Java may have noticed the extremely large number of entirely albino buffaloes there, quite 20 per cent. of those on the island.

The Banting (*Bibos sondaicus*) is also very successfully domesticated in Java and Bali where it is indigenous.

G. C. SHORTRIDGE.

CAMP, BELLARY, *August* 1912.

[Both the variations mentioned by Mr. Shortridge are to be seen amongst the dairy buffaloes in Bombay which come chiefly, we believe, from Gujarat, Kathiawar and the Punjab.—EDS]

No. VIII.—TSINE (*BIBOS SONDAICUS*) CONSORTING WITH TAME CATTLE.

I was greatly interested in Mr. Hauxwell's note in the Journal published in July of a bull Tsine (*Bibos sondaicus*) consorting with tame cattle. To quote Mr. Hauxwell, "it is not an old bull, and it is strange why it should have taken to this solitary life. Can it be that it has been driven out or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the herd by an older and stronger bull, and so forced to come to the village cattle for companionship ? "

I make no doubt that this is exactly what has occurred. I have known of three similar cases, two of Tsine consorting with tame cattle, and one of a Gaur which had attached itself to a herd of tame Mithan (*Bibos frontalis*). All three were young bulls—I have also heard of an old bull Tsine which was supposed to frequent cultivation in pursuit of tame cattle ; but as my informant was a Burman it is possible that he may have been deceived by the size of animal into thinking it an old bull. An old bull Tsine shot by me was said to be this very beast, but I always had my doubts on the subject. His tracks were found some miles from the nearest cultivation and he was killed in dense Bamboo jungle. Still he may have consorted with tame cattle from time to time and the fact that he was well past his prime lends colour to the supposition. As all sportsmen know who have hunted Gaur and Tsine frequently, it is by no means an uncommon occurrence to come across quite young bulls leading a solitary existence, and the only explanation that presents itself is that they have been driven from the herd by the master bull. One would naturally expect, therefore, that when Tsine are found consorting with tame cattle they would be young bulls, or very occasionally old bulls past their prime. The sexual instinct would naturally be stronger in young bulls than in animals past their prime, and the former would also be less shy and wary than the old stagers. At the same time it is conceivable that in the case of very old bulls driven from the herd by stronger rivals, the sexual instinct would in some cases assert itself and the animal, debarred from consorting with its own kind, would occasionally take refuge in an artificial existence rather than become a recluse for good. Such cases, if they occur at all, must be of rare occurrence, and it would be interesting to have authenticated data on the subject. I do not know of any case of a bull in its prime—whether Gaur or Tsine—consorting with tame herds of Mithan or cattle, and it would seem to be extremely unlikely that any such could occur. My own theory is that when such animals take to a solitary existence they do so from choice, and merely for the time being. It was once my good fortune to shoot an erstwhile solitary bull Tsine while with a herd which he had joined on the day he was killed. This beast was a bull in his prime with a very fine head, showing no signs of advanced age. He had merely joined a herd when it suited him to do so. It may be asked why such an animal finding itself near a herd of village cattle should not join them as a younger beast occasionally does. The obvious reply is that the younger animal having been driven from a herd of his own kind is faced with two alternatives—either to remain solitary until old enough to take possession of a herd or to consort from time to time with tame cattle. The older beast on the other hand can appreciate a herd whenever inclined to do so ;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

for even if driven from his own herd—an unlikely supposition—he is sufficiently powerful to find other herds in which he can hold undisputed away. But I would not be held to dogmatise on a subject of which we know very little. I state my theory for what it may be worth, in the hope that some observer with more knowledge of the subject than I can lay claim to will be able to throw more light on this very interesting question. While no one can account for the vagaries of individuals even in the animal world, it will, I think, be admitted as a general rule that for wild animals to consort with tame is an unnatural state forced on them by circumstances beyond their control, and that no animal having access to its kind is at all likely to seek an artificial existance even for a short period.

MALAKAND, *20th August* 1912. G. P. EVANS, MAJOR,
XIX Punjabis.

No. IX.—HABITS OF THE KASHMIR STAG (*CERVUS KASHMIRIENSIS*) IN SUMMER.

The comparatively high altitudes to which the Kashmir Stag ascends in summer has probably attracted little attention, interest in this animal being, as a rule, confined to the shooting season when it descends, and keeps mainly to the forest levels. This year I frequently saw 'Barasing' (so called) and their numerous tracks on a hill top, 14,000′, and on one occasion observed a herd of about 16 hinds at 14,000′ and still climbing by a track which would take them to the water shed 15,000′ and over, and for which I have little doubt they were making. These high ascents, far above forest levels, are made in the mornings, and are generally for the purpose, besides grazing, of indulging in a midday siesta at some elevated spot where fancied security from enemies may be obtained.

The unwariness of a big stag met with one day afforded me what must be a rare, if not unique, experience. On a hillside at 13,500′ the sudden appearance of what, at first sight, looked like a great caribou head, over a snow field above me caused me considerable astonishment. But realizing that caribous do not exist in the Himalayas, and that it was a big stag in velvet, I had to deal with, I stood and watched, and saw the 'head' slowly sink behind the snow again. Feeling sure that the owner thereof had settled down to rest I decided to stalk him. The only route lay to windward and a fresh breeze was blowing across the hill. Notwithstanding I managed to reach unobserved and unwinded a small mound behind which I suspected he was lying. Creeping up and peeping cautiously over, there, sure enough, lay the great beast—a true 'monarch of the glen' fast asleep and only 16 yards (paced) away. Luckily my terrier, who was

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

behind me, did not scent or spot the sleeping animal, and I was able to survey him at leisure. Though he lay with head towards me and I was quite conspicuous, taking little trouble to conceal myself, he never winked an eye, only his ears flapped lazily keeping off the flies. The head was a fine one (12 pointer) but thick in velvet. The coat was patchy and evidently in process of being shed. I gazed my fill, then dropping quietly behind cover again, left him to his siesta and passed on up the hill. As luck would have it my camera was not with me that day and I have since often regretted the unique snapshot lost. From a coign of vantage, some 800 yards beyond and above, not a movement of the stag could escape me so I sat and munched my sandwiches and enjoyed the panorama of snowy peaks and glaciers spread before me.

For 2 hours or more he slept peacefully. Then, rising, shook himself, sauntered across the snow, and proceeded to drink at a puddle left by the melting snow, after which he began to drop slowly down hill, on the steep side, browsing the while. Wishing to have a last look at him on my way down I made for the spot where he had disappeared from view and peered over.

There he still stood, some 80 yards below, browsing quietly. I let him see me but he evinced little sign of fear, merely dropping a few feet lower, and resuming his browsing. But for my terrier which, this time, spotted him and gave him chase, I could have approached him much closer. Seeing the terrier he rattled down hill and out of view, leaving a void in the picturesque landscape.

When descending a hill these stags look awkward and clumsy compared with the graceful bounding movements of Markhor or Ibex.

Some days later a further curious experience with Kashmir Stag befell me on this same hill. Climbing it with a brother officer we had a cooly with us carrying our paraphernalia. When some way up I asked the latter if he had ever been on this hill before and if he knew that "Barasing" lived on top. He replied that he had not, and expressed a desire to see a "Hangul." This I undertook to promise to show him. Within 5 minutes of this conversation, appearing slowly over a ridge to our left, we saw the antlers of a big Barasing, then the whole animal standing on the sky line. Following him came another, then another, and still others, until there were *five* grand stags, all apparently good shootable heads, standing in full view and barely 400 yards away! No one was more astonished than I, for although feeling pretty confident of meeting with *a* stag that day, I was not prepared for the splendid fulfilment of my promise in the vision we had just seen. For some days after this I believe I bore the reputation of being a "Jadu-gar."

H. A. F. MAGRATH, Lt.-Col.

Kashmir, *August* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. X.—ABNORMAL TYPE (?) OF EGGS OF THE LITTLE FORKTAIL (*MICROCICHLA SCOULERI*, Vigors).

On the 12th May last, I found a nest of this species placed in the niche of a rock by the side of a large waterfall in the neighbourhood of Simla. The position of the nest was betrayed by one of the birds, which hurriedly left the spot on my approach. On examining the nest I found that it was practically completed, and was ready for the birds to lay in. Allowing a few days to elapse I sent one of my hunters to bring away the eggs, if any, and also the nest. He carried out my instructions, but, on examining the eggs, which were quite fresh and three in number, I was much astonished to find that they were *pure spotless white*. I immediately questioned my man as to the identity of the bird, which he knows *well*. He firmly maintained that the eggs in question belonged to this Forktail, that he had distinctly seen it leave the nest on his approach, and that when he removed the eggs they were quite warm. I have no reason whatever to doubt the man's statements, for I have always found him truthful, and in this instance there was no particular reason for him to deceive me; but nevertheless I still feel rather disturbed about the colouration of these eggs. Had I for a moment foreseen this contingency, I should of course have spared no pains to put the identity of the bird beyond doubt. As things stand now, *there is doubt* but doubt which can be dispelled by the experiences of other Ornithologists.

I should like to know whether this Forktail, like some other birds, for example, *Dicrurus ater*, lays eggs of two different types: one, pale dingy pink, spotted and speckled with reddish brown, and the other pure spotless white?

The eggs from this nest are, as already stated, pure spotless white, and they have a distinct gloss. In shape they are somewhat elongated ovals, slightly pointed towards the small end. Their measurements compare as follows with those of the normal type:—

Abnormal type (?) of eggs.	*Normal type of eggs.*
(1) ·81″ × ·58″	Average measurements of 11 eggs
(2) ·82″ × ·58″	= ·79″ × ·57″
(3) ·85″ × ·6″	

I may add that there is no doubt whatever about the nest. It was of the usual Forktail type—a small cup, composed externally of moss, and lined with a little dry grass, and a few dead and skeleton leaves.

Since the publication of my notes about this species at pages 257—261 of Vol. XXI of the Journal, I have found the following nests in addition to the one mentioned above:—

(*i*) *Keonthal State*, 1st May: elevation 5,000 feet; nest with three young, just hatched.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(*ii*) *Keonthal State*, 21st May; elevation 5,000 feet; 3 hard set eggs (normal type).

(*iii*) *Ditto.* 21st May; elevation 5,000 feet; two young, full fledged.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 29*th August* 1912.

No. XI.—NESTING OF THE WESTERN BLUE ROCK THRUSH (*PETROPHILA CYANUS*, Linn) IN THE NEIGHBOURHOOD OF SIMLA, N.-W. HIMALAYAS.

After several years of fruitless search, I have at last succeeded in finding the nests of this species, which is a tolerably common summer visitant to these N.-W. Himalayan ranges, arriving in April, and leaving about the beginning or middle of September.

In the neighbourdhood of Simla, it breeds at elevations of 6,000-7,200 feet, on bare rocky hills, during May and June. The nests are shallow saucers, in some cases mere pads, adapted to the shape of the cavities in which they are placed, and are composed externally of dry grass, lined with rootlets. The diameter of the egg-cavity does not exceed 4″, and its depth is about 1½″. The external diameter varies from 5 to 6″, and the height is about 2½ or 3″. The nests are placed sometimes in low stone walls occasionally under boulders, but more frequently in fissures or crevices of large rocks.

The number of eggs is usually four, and their colouration is exactly as described by Dresser in his "Manual of Palaearctic Birds", page 23. The "speckled" eggs seem to be the commoner type.

The average of 12 specimens measured was 1·01″ × ·75″.

Between the dates 18th May and 20th June, I found, in addition to the eggs mentioned above, no less than eight nests containing young ones. Five of these nests had three young each, and two, four young each: the exact number of young in the eighth nest could not be satisfactorily ascertained, as the latter was placed very far back in the fissure of a large rock.

The nests of this Thrush, especially when they contain eggs, are most difficult to find, as the old birds are very cautious and wary in their movements, and it is only by patient and laborious watching that one can hope to be successful with them. The cock bird, though he helps in feeding the young, and is always much in evidence when the eggs are hatched, keeps far away from the scene when building operations are in progress. The hen alone carries the materials, and if she catches sight of one, or suspects that she is being observed, will sit on a rock, with the grass in her mouth, for whole hours at a time, rather than give away the show.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

When there are eggs in the nest the hen bird sits very close, and on two occasions I have caught her on the nest. So far as my experiences go, I do not think that the cock takes any part in the hatching of the eggs.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 29*th August* 1912.

No. XII.—THE HIMALAYAN GREENFINCH (*HYPACANTHIS SPINOIDES*).

In Mr. P. T. L. Dodsworth's interesting note on *Hypacanthis spinoides* (The Himalayan Greenfinch) in Vol. XXI, No. 3, p. 1076 of this Journal, he gives the distribution of this species as follows :—" Along the Himalayas at elevations 6,000—10,000 and perhaps even higher from the south side of the Pir Panjal Pass in Kashmir (Brooks) to Sikkim (Blanford) also recorded from Manipur (Godwin Austen). During the cold weather these birds move to tower elevation, and the N.-W. Himalayan ones at all events are found in the Duns and plains (Bijmor to Pilibhit) at the foot of the mountains (Osmaston). In quoting this as the distribution Mr. Dodsworth has apparently overlooked various publications in this Journal from the pens of Colonel Rattray, Captain C. H. T. Whitehead and others which add considerably to our knowledge in this respect and shew that the range of The Himalayan Greenfinch extends very much further to the North-West. For example it is common in the Murree Hills and Hazara. It occurs in the N.-W. F. P. (Samana), and not improbably breeds in the Kurram Valley. I may add also that in parts of the Peshawar Valley it is a common winter migrant, being freely snared there for the Peshawar bazaars, where it is a favourite cage bird with the Pathans. With regard to Kashmir its range extends well north of the Pir Panjal and the Vale of Kashmir itself, in the Liddar and Sind Valleys, it breeds commonly from 7,000 to 9,000 ft.

H. A. F. MAGRATH, LT.-COL.

KASHMIR, *August* 1912.

No. XIII.—EARLY ARRIVAL OF GREY WAGTAIL.

I am sending you a specimen of what I think is the Grey Wagtail (*Motacilla melanope*) shot near here on the 22nd August, by a stream in the midst of dense jungle. Chikalda is 125 miles south of Sehore as the crow flies; but Capt. Whitehead, in his article which appeared on page 153 of Vol. XXI of the Journal, notes its earliest appearance at that place as the 20th September. Considering how late the rains broke here, not until the 10th July, and that it breeds in Kashmir above 6,000 ft. and in Afghanistan in May and June (dates on p. 294 of Vol. II, F. B. I.) This must be distinctly an early bird.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Will you kindly verify my identification of the specimen which is unfortunately in a somewhat shattered condition ?

J. DONALD, I.F.S.

CHIKALDA, BERAR, 22nd August 1912.

[The bird is as Mr. Donald suggested a Grey Wagtail *M. melanope*.—EDS.]

No. XIV.—EGGS OF THE LARGE HAWK-CUCKOO (*HIEROCOCCYX SPARVERIOIDES*).

In his "Indian Parasitic Cuckoos" Mr. E. C. Stuart Baker reproduces an article of his printed in the Journal of the Bombay Natural History Society in 1906. The article shows that at the time of writing, the oology of this cuckoo was not so thoroughly known as not to require further investigation. Colonel Rattray was then the only person who had obtained undoubted eggs of the bird, and though these were blue Mr. Stuart Baker hinted at the possibility of there being also a chocolate coloured variety.

For many years my brother Mr. B. B. Osmaston has tried to obtain eggs of this cuckoo from the Himalayan region round about Naini Tal where at suitable elevations it is no uncommon bird. During the rains of 1911, he found a nest of the Red-headed Laughing-Thrush (*Trochalopterum erythrocephalum*) close to Naini Tal and it contained two Laughing-Thrush's eggs. Intending to rear the young birds he sent his chaprassy a few weeks later to fetch them. The chaprassy returned with a young cuckoo, the sole occupant of the nest, and the cuckoo proved to be a young one of *H. sparverioides*.

We now knew that this cuckoo laid her eggs in the nest of this bird, and we decided to thoroughly search the same place again this year for eggs. The hill overlooking Naini Tal rises to a height of 8,600 feet, and for the last 1,000 feet the vegetation is chiefly "Karshu" oak mixed with shrubs of various species. There are scarcely any birds breeding here during the rains excepting the Red-headed Laughing-Thrush (*Trochalopterum erythrocephalum*) and Himalayan Streaked Laughing-Thrush (*Trochalopterum lineatum*) and of these the former is by far the commoner. In the beginning of June my brother visited the place and found the Large Hawk-Cuckoo calling incessantly and in considerable numbers, but the Redheaded Laughing-Thrushes had hardly commenced nesting. At the beginning of July the cuckoos were still continually to be heard and the Laughing-Thrushes were nesting in earnest.

On 7th July I found a nest of *T. erythrocephalum* containing two fresh Laughing-Thrush's eggs and one fresh cuckoo's egg. The nest was about six feet from the ground in a dense holly bush. When I took the eggs a cuckoo (*H. sparverioides*) was calling lustily only fifty yards away.

On 18th July I found another nest of *T. erythrocephalum* containing one

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fresh cuckoo's egg. The nest was placed about 8 feet from the ground in a small Deodar. There is some mystery about this nest as it contained no Laughing-Thrush's eggs, nor were the parents lurking round as they usually do. In fact there had evidently been some tragedy recently enacted for the nest contained besides the cuckoo's egg, a small piece of fresh meat with a little skin and a few bedragled feathers adhering to it. The nest, however, was not disturbed. When I found the nest a cuckoo was calling persistently only 100 yards away.

On 28th July I found another nest of the same Laughing-Thrush about eight feet from the ground in a young oak tree. It contained one Laughing-Thrush's and one cuckoo's eggs, both quite fresh. This time I did not hear the cuckoo calling as on previous occasions.

These three nests containing cuckoo's eggs were all found within a quarter of a mile of one another, and on the many occasions on which I hunted the locality I never failed to hear the cuckoo calling close round, yet never heard the call of any other cuckoo. The elevation was about 8,200 ft. Though there is no absolute proof of their identity there is little room for doubt, considering also that they agree with the authenticated eggs obtained by Colonel Rattray.

All three eggs are of the same colour and texture. They are pale greenish-blue (almost exactly the same blue as the ground colour of the Laughing-Thrush's eggs) and distinctly glossy. They are also traced by distant corrugations and minute raised dots. Their shape is a narrow oval compressed at the smaller end in two of the specimens, but not in the third. The dimensions of the eggs are as follows :—

Egg taken on 7th July 1912	.. ..	1·18″ × ·81″
,, ,, 18th July 1912	.. ..	1·10″ × ·81″
,, ,, 28th July 1912	.. ..	1·11″ × ·84″

The eggs of the Laughing-Thrush are ordinarily spotted round the larger end though occasionally unspotted eggs occur, but even in these rare cases the cuckoo's eggs may be at once recognised by their glossiness, those of the Laughing-Thrush being entirely without gloss.

NAINI TAL, 21*st August* 1912. A. E. OSMASTON.

No. XV.—QUESTION WHETHER *GYPS FULVUS*, Gmelin, THE GRIFFON, OCCURS IN THE HIMALAYAN DISTRICTS OF THE PUNJAB.

Assuming that the *Gyps fulvescens* of Hume is identical with the *Gyps fulvus* of Gmelin, the common Griffon of Europe, I should feel much obliged if some Ornithologist would kindly let me know whether he has observed this bird in the *Himalayan* districts of the Punjab, and, if so, at wha places ?

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Strachey records * it from Kumaon, and Blanford gives (Fauna, B. I. (Aves), iii, p. 320) its range in the *Himalayas* as extending east as far as Nepal and Sikkim, but I have been unable to trace all the data on which the latter statement was founded.

The common species in the neighbourhood of Simla is the Himalayan Griffon, *Gyps himalayensis*, Hume. And this is the Vulture, not *Gyps fulvus* that Colonel C. H. T. Marshall mentions (Ibis, October 1884, p. 405) in his list of Chamba birds.

Hume spoke (Rough Notes, p. 21) of the Griffon—his *Gyps fulvescens*—as the "Vulture of the desert," and it seems only reasonable to conclude that if it had occurred in the N. W. Himalayas, he would surely have mentioned the fact.

I see that Colonel Ward includes (J. B. N. H. S. Vol. XVII, p. 728) *Gyps fulvus* in his birds of Kashmir, where, he says, it is resident in many districts, but on the other hand it is significant that Davidson never saw it there (Ibis, January 1898), and all the Vultures procured by Dr. Abbott (Proc. U. S. N. M. Vol. XVIII, p. 453, and Vol. XXII, p. 210) in that country turned out to be Himalayan Griffons—a totally different species.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., *27th May* 1912.

[In 1869 Hume described *Gyps fulvescens* and on account of the knowledge of its distribution then wrote of it "as the Vulture of the desert." Since, however, this vulture has been recorded from Nepal and still later under the name of *Gyps fulvus* by Colonel Rattray from Thull and Captain Whitehead from the Kurram Valley. Though Dr. Blandford treated *fulvescens* as a synonym of *fulvus*, Dr Sharpe both in his catalogue and hand list considered them distinct giving the distribution of *fulvus* as "S. and C. Europe, N. Africa and Sudan," and that of *fulvescens* as "Afghanistan, N. India"—EDS.]

No. XVI.—A KITE'S LARDER.

With reference to Mr. Remington's enquiry in the last issue of the Journal, I do not think it is usual for this species (*Milvus govinda*) to make "larders." During a course of observations extending over several years, I have only once come across a "larder." It was in Calcutta where, on a certain tree, a pair of these Kites have bred for several years in succession. From my Office window the nest was not distant more than 10 feet, and I had ample opportunities of closely observing the owners. I noticed that the Kites frequently brought dead rats, bones, pieces of meat, and ate them on the edge of the nest, leaving the scraps behind to

* Is it possible he confused this bird with *Gyps himalayensis*, Hume ?

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be devoured at leisure. Both the old birds resorted to this "larder" at frequent intervals during the course of the day, and for many months after the young had left the nest.

In connection with the breeding of this species, I may mention that I have frequently found lumps of clay and small stones in their nests when the latter contained eggs (see also Jesse in "Ibis," January 1903, p. 75), but have never yet been able to make out what purpose this rubbish serves. I daresay other Ornithologists have had similar experiences, and it would be interesting to know what explanations, if any, have been advanced in regard to this curious practice indulged in by these Kites.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 29*th August* 1912.

No. XVII.—TAMENESS OF GREAT INDIAN BUSTARD (*EUPODOTIS EDWARDSI*).

With regard to the recent articles on Bustard in your Journal, readers may be interested in hearing that, in spite of the extreme wariness of the Great Bustard, on the 15th of May this year, I came upon a pair of these birds wading at the edge of a large pond and drinking. The pond itself is about half a mile from a town of considerable size and there were at the time a group of dhobies washing clothes on the opposite side of the pond within 200 yards of the Great Bustard. I myself walked to a point just opposite them, and about 90 yards distant from them, so there can be no mistake about their identity. I enquired whether any had been seen before in the locality and was informed that they had not. It would also appear that these particular birds were in the practice of coming here to drink, for a friend of mine who happened to visit the pond some three days later also says he saw them. I do not suppose for a moment that it is an unknown characteristic of the Great Bustard that he should come to drink at ponds, but I am surprised that such a retiring bird as he should come to drink at a popular dhobies' ghat.

R. TEAGUE JONES,
Indian Police.

FEROZEPORE, PUNJAB, 4*th August* 1912.

No. XVIII.—BUSTARD IN KATHIAWAR.

In ordinary years during my district touring in Sorath Prant I have occasionally come across a solitary Great Indian Bustard (*Eupodotis edwardsi*) sometimes two or three together, but they are by no means

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

common. This year owing to the failure of rain in other places I suppose these birds have been seen in large numbers throughout the Prant. In all I have seen over fifty close to my headquarters alone. In one morning I came across two distinct groups of 9 and 10 together. At the time of the bajri harvest they could be easily bagged with a shot gun, being feeding so busily as to be quite off their guard, and I once got two fine cock birds 18 and 20 lbs. in weight, left and right. After the crops were cut they could only be bagged with a rifle. One male bird of 16 lbs., I had shot with a ·310 rifle and on picking him up by the legs to feel his weight a long red thing dropped from his mouth. On examining it closely I found it to be the partially digested body of a snake about 2 ft. long. In the stomach of the same bird I found another snake, "a phoorsa," evidently recently swallowed, and two stones measuring 1¼ inches by 1 inch. I have got the snakes and stones in spirits and will send them to you on the first opportunity. As the hot weather advanced the Bustard disappeared and I have not seen one since early in April.

J. R. CARTER, MAJOR,
Bombay Political Department.

CAMP VERAVAL, *7th June* 1912.

No. XIX.—THE GREAT INDIAN BUSTARD (*EUPODOTIS EDWARDSI*).

During a shoot in February 1906 in the Bikaner State near Bhatinda, with a party of four guns, Mr. R. Sale Bruise, Punjab Police of Karnal, shot a male bustard. The neck of the bird was pure white, its length from tip of wing to tip of wing was exactly 98 inches and the weight 24lbs. The food bag contained, whole ears of barley; some (blister ?) beetles, and a snake about 9 inches long.

Two females were also shot close by, but they weighed only 8 and 9 lbs. They had also been feeding on barley and beetles, but had been unfortunate in their hunt for reptiles.

A. B. AITKEN.

QUETTA, *20th August* 1912.

[We are glad to welcome this note from Mr. A. B. Aitken, the son of the late Mr. E. H. Aitken, one of the founders of this Society.—EDS.]

No. XX.—THE MASKED BOOBY (*SULA CYANOPS*) IN BOMBAY HARBOUR.

Through the kindness of Mr. E. R. H. Jackson of the Bombay Port Trust, the Society has received a fine specimen of the Masked Booby, which was captured in an exhausted condition on a dredger near the new

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

dock works. In 1909 a similar specimen, also captured in the harbour was presented by Mr. Jackson and there is another specimen in the Society's collection labelled "Bombay Coast, 25-7-02". Mr. W. F. Sinclair writing of this bird in an early number of the Society's Journal says that "It is not uncommon for these birds to be brought up here (Alibag) by south-westerly gales and be caught by hand."

According to the catalogue of birds in the British Museum this bird is found in the tropical seas throughout the world, but when the catalogue was published there were in the collection only two skins from north of the equator, one from Tenasserim and the other from the Mekran Coast. In the Handlist of birds, however, the distribution is given as "S. Tropical Seas."

N. B. KINNEAR.

BOMBAY, *August* 1912.

No. XXI.—BAIKAL OR CLUCKING TEAL (*NETTIUM FORMOSUM*).

The S. S. "Empire" of the Eastern & Australian Line on her homeward voyage from Japan to Australia in January 1912 had on board a consignment of about 300 Baikal or Clucking Teal in cages. The cages were kept on the bridge deck out of the way of the passengers, where they could not be seen. The passengers in the smoking saloon of the upper deck were always aware of the continual clucking noise that the teal made. The noise was very similar to that made by a clucking hen. In fact all the passengers were under the impression that the Captain, for some reason known only to himself, had a large stock of clucking hens on the bridge deck. One passenger, who was told that the noise proceeded from ducks, would not believe till he saw and heard with his own eyes and ears. The purser was unable to give any information beyond the fact that the teal had been shipped in Shanghai and were consigned to Port Darwin, and that a similar consignment was carried on every voyage.

A. B. AITKEN.

QUETTA, 20*th August* 1912.

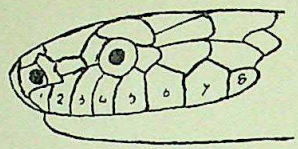
No. XXII.—IS *LYCODON GAMMIEI* (Blandford) AN ABERRANT SPECIMEN OF *LYCODON FASCIATUS* (Anderson)?

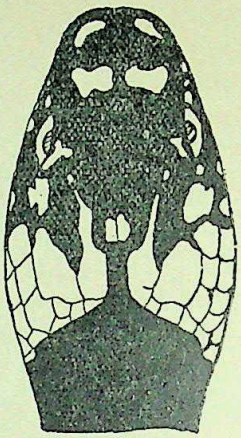
In Vol. XXI of the Journal (Part I, page 279) Major Wall compared my specimen of *L. fasciatus* obtained in the Eastern Himalayas with the type of *L. gammiei* which is in the Indian Museum.

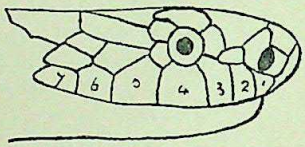
Regarding the point of the loreal shield, I must admit that it is pointed, to some extent, posteriorly and not anteriorly as stated, the third labial and the præocular intervening between it and the eye.

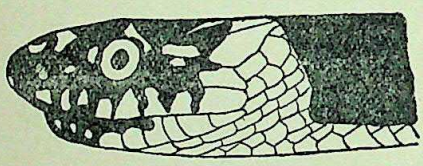
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri









I figure the exact condition of this shield and also a drawing of the markings on the head. The dark portions are deep black and the rest yellowish green. The illustration is about twice the natural size.

NAGPUR, C. P., 13*th August* 1912. E. A. D'ABREU, F.Z.S.

No. XXIII.—NOTES ON THE SIZE AND BREEDING OF THE COMMON GREEN WHIPSNAKE (*DRYOPHIS MYCTERIZANS*).

Two common green whipsnakes were recently purchased from a snake-charmer, who said they came from Thana and Bandup (Salsette) respectively. Both were large specimens, the Thana one measuring 6′-4½″, while the other was 5′-10″.

On 14th August the larger of the two specimens died in our museum and on being dissected was found to contain fifteen young ready for expulsion. Two days later the remaining specimen gave birth to eighteen young, one of which was born dead, having been unable to clear itself of the egg envelope. The remaining young sloughed on the second day after birth. They measured 13 inches.

BOMBAY, *September* 1912. N. B. KINNEAR.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXIV.—COBRA BREEDING AT PAREL.

During the past ten years many of the cobras (*Naia tripudians*) sent to the Bombay Bacteriological Laboratory have laid eggs while in captivity, but hitherto all attempts at hatching out young cobras have proved failures. Whether left with the mother, or kept apart from her, the eggs have always shrivelled up and no development of embryos took place. When kept in an incubator at blood-heat, the eggs became rotten in a few days, and when buried in dry sand they shrivelled up.

In 1905 a full grown krait (*Bungarus cæruleus*) and some half dozen eggs were dug up close to the Laboratory. Some of these eggs were kept in a box with the mother, and some were buried in the soil in which they were found. Both sets of eggs remained infertile.

In 1909, Major Liston, I.M.S., suggested that the cobra mother and her eggs should be placed in a glass case half full of sand, that the case should be darkened by winding cloth round it, and that the sand, and the cloth cover of the case be kept moist. Next day one egg was examined and a trace of embryo found. Unfortunately the mother died 9 days afterwards, and the eggs shrivelled up.

This year (1910) we had occasion to require a considerable number of cobras for experimental purposes, and four out of 21 laid eggs, and gave us the chance of experimenting further. Two of these cobras laid 21 and 22 eggs respectively, the other clutches were not counted as the eggs were glued together and mixed up with shreds of the mother's cuticle, and it was thought advisable to leave them alone. These latter batches all proved failures as far as hatching out young ones was concerned.

With regard to the period of the year when young cobras may be looked for, our experience is that the month of May is the usual time. Thus from 1st January to 31st May 1910 we received 24 cobras, of which 4 laid eggs; while after the 31st May 25 more cobras were received and none laid eggs.

The following table shows the date of receipt of cobras, and the laying of eggs :—

Number.	Date of receipt of cobras.	Date on which cobra laid eggs.	Place from which received.
28	11-1-10	12-5-10	Khandwa.
30	11-1-10	14-5-10	"
39	20-4-10	11-5-10	"
42	30-4-10	9-5-10	"

The following is an account of the plan we employed with success in the case of the eggs of cobra No. 28 :—

The eggs were laid in the tin biscuit box in which the cobra was kept on 12th May 1910. The eggs, 21 in number, were placed on the surface

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of moist earth which four-fifths filled an ordinary garden flower pot. The eggs were then carefully covered with dry sifted earth to a depth of one inch, and the earth also slightly moistened. The pot was kept in a cool dark room. Next day we carefully removed the covering earth and found to our joy that the eggs were plump and fresh, looking though, of course, stained by the damp covering. The earth was replaced, and carefully sprinkled with water by old Benjamin, the snake man, who took quite a naturalist's interest in the proceedings. We had no idea of the incubation period of snakes' eggs, so sent Benjamin to enquire of some Bombay snake-charmers. He brought back news that 21 days was the recognised time. So on the 2nd of June, 22 days afterwards, we dug out one egg and opened it to see what progress had been made. The egg was quite plump and fresh looking, and contained a quantity of clear albumen, with a well formed embryo in one end of the shell. The small embryo snake was coiled up beside the yellow yolk, and with a small cord connecting it to a placenta attached to the shell. The embryo was white in colour, almost four inches long, and the heart could be seen distinctly pulsating. No scales could be made out on the skin, but the head, was large with two prominent eyes.

On the 23rd of June, *i.e.*, on the 43rd day, we opened another egg, and found another living embryo in a further stage of development. It was some seven inches long, with well developed scales on the skin, and the heart could be seen beating vigorously.

The pot was watered daily as before, and was covered with wire netting as a precaution against the escape of the young should they happen to hatch out during the night. At length on the 18th of July, 67th day, a cobra head was noticed protruding, as far as the neck, from the egg shell. This specimen was removed from the flower pot and carefully washed in a basin. On enlarging the opening a little the embryo emerged with the placenta still attached.

On the following day others were found in a similar condition. They were left alone all night to see if they had strength to deliver themselves. Two had succeeded in this endeavour, but one of them being dead, it was thought advisable to render artificial aid to the others, and several of the little cobras lived for several weeks after. It was noted as a curious fact that all the young cobras had well developed spectacle marks on their hoods, although the mother was a black "cæca" from the Central Provinces, with no trace of a spectacle mark on the hood!

The new born cobras had a cutting chisel on the snout of the same shape and appearance as that described by Major Wall in the Society's Journal, Vol. XXI, page 693. Major Wall saw the specimens, but unfortunately the notes on the subject which he kindly jotted down have been mislaid owing to the transfer of one of us (Col. W. B. Bannerman, I.M.S.) to Madras.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

In all, 21 eggs were placed in the flower pot. Two were opened to see what progress the embryos had made; four were found shrivelled (on 4th June) and proved on dissection to be infertilised and quite solid. Of the 15 remaining eggs, 14 hatched out at full time, and one was dead in the egg but appeared fully developed.

W. B. BANNERMAN, I.M.S.,
Surgeon-General.

J. P. POCHA, LM. & S.,
Senior Assistant Surgeon.

BOMBAY BACTERIOLOGICAL LABORATORY,
PAREL, 15*th July* 1912.

No. XXV.—BREEDING OF THE COMMON GREEN VIPER (*LACHESIS GRAMINEUS*).

On 30th June a female Common Green Viper which was said to have come from Khandalla gave birth to fifteen young in our Museum. They sloughed first on 24th July. The brood vary considerably in colour, some being much darker than others and nearly all show the blackish markings on the back, though in the light coloured ones it is very faint. The mother belongs to the variety which has a yellow line along the side of the body, but in the young this line is hardly discernable. It has been found impossible to get the young snakes to feed naturally, though they have been tried with earth worms, young frogs, grasshoppers, young cockroaches and other insects. They have however been fed twice with raw meat and the nine which are still alive look well and are beginnin to grow.

N. B. KINNEAR.

BOMBAY, *September* 1912.

No. XXVI.—SAW-SCALED VIPER (*ECHIS CARINATA*) AS A TREE SNAKE.

Some time ago a note appeared in the Journal stating that the phoorsa very rarely climbs trees. At the time I doubted the correctness of this as regards the habits of this snake in North Gujarat, as ten years ago I frequently found a snake, which I believed to be of this species, on cactus hedges and in bushes and small trees a few feet from the ground. I presumed however that I might possibly have been mistaken in my identification of the species, though I did not think it likely. I have now returned to the same part of the country and find that my original belief was correct. In confirmation I am sending you a specimen of *Echis crainata* which I found this week and killed in the outer branches of a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lime tree at a height of 4 feet from the ground. *Echis* is not a difficult snake to recognise if one knows its "points" but perhaps you will kindly confirm my identification.

A. H. E. MOSSE, CAPT., I. A.

PALANPUR, N. GUJARAT, 23rd *July* 1912.

[The specimen sent by Captain Mosse is certainly *Echis carinata*.—EDS.]

No. XXVII.—HABITAT OF *ECHIS CARINATA*.

It is generally supposed that the saw-scaled Viper (*Echis carinata*) is rarely seen at a height of 5,000 feet. Major Wall in his book "The Poisonous Terrestrial Snakes of our British Indian Dominions" writes of the *Echis*: "It is an inhabitant of the plains and becomes progressively scarcer at altitudes ranging up to 5,000 feet. 5,700 feet is the highest I know of."

It is of interest therefore to note that at Kacha Thana, a small outpost in the hills of the Chagai Tahsil of Baluchistan, at an altitude of 5,000 feet, the *Echis* is quite common. During the past three months I have obtained six specimens, all from the Kacha nullah, at heights ranging from 5,000 to 5,400 feet.

Unlike the Persian Horned Viper, another common snake in this locality, the *Echis* is apparently not timid in approaching human habitations. About a fortnight ago while the Officers of the Garrison were sitting in front of the Mess Bungalow before dinner, an *Echis* was observed quietly making its way under the chairs. It passed beneath the whole line of deck chairs and was unconcernedly heading for the verandah when I captured it.

Local Balochis call the *Echis* "landi mar" evidently in allusion to the brevity of its caudal appendage. It is also occasionally named "gwanden mar" or "little snake" in contradistinction to the "shakhwala mar" (*Pseudocerastes persicus*), an altogether bigger and stouter snake and the only other poisonous species common in this part of Baluchistan.

G. G. JOLLY, CAPT., I.M.S.

KACHA THANA, 2nd *September* 1912.

No. XXVIII.—"POISONOUS" LIZARDS IN INDIA.

With regard to "poisonous" lizards you may be interested to have one little piece of negative evidence. Last Saturday (17th) being Nag Panchami up here, some of the servants went round showing a number of snakes and a "gubera" (young *Varanus*). We were assured that this was deadly poisonous, but after it had been on show for about three hours—with a string tied round its middle—it apparently got annoyed and turned round and bit the man in his finger. The unfortunate man sucked

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the wound and looked rather frightened and then went on showing his snakes ; he is still alive and doing his regular work.

H. F. SAUNDERS.

THE FORT, GWALIOR, C. I., 26*th August* 1912.

[This subject was thrashed out in the early numbers of our Journal, Vols. III and IV (1888-9), but the belief is still apparently as strong as ever in Gujerat, Sind, Rajputana, Central India and Baluchistan that the young of the *Varanidæ*—otherwise known as Monitors or "Ghorpads," "gho-samps," also "Bis-cobras"—are poisonous.

It is difficult to trace whence this opinion has arisen. In Kaira, Gujerat, it is known as "Chandan-goli" and is "said to be as deadly as a cobra and able to spring ten paces" (A. Wood, I.C.S.).

Other lizards in India also bear an equally evil reputation, particularly *Eublepharis hardwickii* and *E. macularius*, but so far as can be ascertained *no lizard in India is poisonous*.

According to Mr. E. E. Green "the Brahminy Lizard," the common skink, *Mabuia carinata*, holds a similar reputation in Ceylon. He mentions a case in which a lady was bitten by one of these lizards. The injured finger in a few hours' time became swollen and tender but by next day practically all the swelling and tenderness had disappeared.—EDS.]

No. XXIX.—THE FOOD OF A BULL-FROG (*RANA TIGRINA*).

In Vol. XXI, No. 2 of our Journal, Mr. S. P. Agharkar states a few things about the diet of a bull-frog (*Rana tigrina*) and remarks at the end of his note that "further observations on this point by our members would yield interesting results." Taking advantage of this remark I put down a few observations on the subject.

On the 5th of September 1910 I dissected a freshly caught frog (*Rana tigrina*) before my B.A. students. On opening the animal, the very first thing, which struck me, was the unusual size of the stomach. I made an incision on the wall of the stomach and on carefully examining the contents I found to my surprise a big mole-cricket (*Gryllotalpides*), twenty maggots of a fly, a big beetle (*Scarabæidæ*), a small shell of a snail and some green vegetable product.

On another occasion, I had put a frog in the cage of a John's earth snake (*Eryx johni*) to serve the latter as its food. In the cage as much of the sand was spread as would be sufficient for the snake to hide itself. After 3 days when I saw that the snake would not go for the frog, I took out the latter and dissected it. On dissection it was found out that the stomach was tensely filled with sand. I cannot say definitely whether the frog had swallowed sand to get some nourishment from the small insects in the sand or for some other purpose.

BIOLOGICAL LABORATORY, J. P. MULLAN, M.A.
ST. XAVIER'S COLLEGE, BOMBAY, 16*th August* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXX.—VITALITY OF A BUTTERFLY.

While watching a cluster of about thirty *Papilio philoxenus* which were feeding on the flowers of a creeper, I noticed one of these butterflies had a large heavy pin driven through the thorax. It must at some time have been caught and pinned down, afterwards escaping. It was in very good condition and the pin did not seem to interfere in any way with its powers either of feeding or of flight, for when I tried to capture it by taking hold of the pin, it darted away and showed itself as strong on the wing as any other of its kind.

G. A. HASSELS-YATES, CAPT., R. G. A.

KHYRA GALI, MURREE HILLS, 11*th July* 1912.

No. XXXI.—THE BED BUG (*CIMEX ROTANDATUS*) ON THE COMMON YELLOW BAT (*SCOTOPHILUS KUHLI.*)

Now that the responsibility of the Bed bug for "Kala azar" has been established, an observation I made in 1907 of the presence of the bug on two specimen of the Common Yellow Bat *Scotophilus kuhli* gains in importance. The bats were taken singly from holes in two cocoanut palms in a village near Tellicherry and were badly infested. Captain Patton, I. M. S., who kindly identified the bugs as *Cimex rotandatus* desired me to collect more bats of the species, but pressure of work of a different kind has left me little leisure to do it and I venture to publish this note in the hope that it will induce others interested to look for the bats and the bug on it.

I may mention what struck me as curious at the time that the bugs were on the bats themselves, rather an unusual habit for the insect. Perhaps the reason was that it was 7 A.M. when I caught them and the bugs starving over night had started just then to feed. The cocoanut trees were about 30 yards from human habitation. The holes on them could not be examined.

K. KUNHIKANNAN, M.A., F.E.S.,
Assistant Entomologist, Bangalore.

BANGALORE, *August* 24*th*, 1912.

No. XXXII.—FLIES ON SNOW.

On the snow covered slope of a glacier in Kashmir at appoximately 15,000 I noticed that part of it, which I was ascending, was discoloured by what seemed to be a coarse, blackish dust, the snow elsewhere being clean and white. My eyes being fixed on this discoloured snow as I climbed, it suddenly dawned on me that the particles of 'dust' were in motion, jumping, and constantly shifting position. At first the thought occurred that I must be suffering from a severe 'go' of vertigo or mountain sickness,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but closer scrutiny revealed the fact that what I had taken to be dust was, in reality, a swarm of minute *diptera*. These tiny flies were thickly peppered over the snow for a space of 100 square yards or more, and apparently preferred to stay where they were or else were incapable of removing themselves by flight. How they got there, or into the predicament in which I found them, is difficult to conjecture, but if I might hazard a guess, I should say they had been wafted in a swarm, in a warm strata of air, from the valley beyond, and, suddenly meeting with the cold air above the glacier, collapsed and fell on the snow in a body.

KASHMIR, *July* 1912. H. A. F. MAGRATH, LT.-COL.

No. XXXIII.—PRESERVATION OF GAME.

Some notes by Capt. Mosse on Mr. Hick's "40 years among the wild animals of India" have induced me to give a few details and make a few suggestions on the subject of game preservation.

Owing to the courtesy of a former Manager of the Court of Wards, I had, in 1911, the opportunity of shooting in one of the largest of the Zamindarys of the Central Provinces. My primary object was to secure a couple of good heads of that fast disappearing race—the C. P. Buffalo—and anything else, provided it did not interfere with my securing these.

The Zamindary has an area of something over 2,500 square miles and I had the opportunity of going over some 1,500 of this and in the localities where it would not be unreasonable to expect to see game fairly plentiful. If it had been during the cold weather that I went over this splendid piece of country, there might have been the argument—difficult to overcome—that one could not expect to find game universally plentiful over such a large area of, except for village sites and deserted village sites, uninterrupted jungle. I was however there during the months of April, May and June. At that time of year till the break of the rains, water is very scarce and there are frequently several miles between one patch of water and the other and if there were game about, their tracks would be found at the water. Although continually about before sunrise, I did not come across a single chital and only once a sambar and that was on the borders of Government forest whence it had come a few hundred yards to feed and where it returned at daybreak. There were several things which appeared to me to be conducive to this state of affairs.

(1) *The Native licensed to have a gun.*

In order to show how this man does the greatest amount of harm and the least amount of good: I should note that in this part of the country there is one harvest of rice, which is sewn at the commencement of the rains and reaped in September or October. Protection of crops is the excuse for a gun in many cases and a very legitimate excuse too, provided the use of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the gun was limited to that. Shooting animals over crops gives both man and animal a sporting chance, anyhow in the estimation of the native and neither crops nor animals would be much the worse. The native however looks a bit further ahead and works out the simple problem that if there are no animals to shoot there will likewise be none to eat the crops. He, therefore, during the hot weather, when water is an absolute necessity and sport (for him) an absolute certainty, sits over the very limited numbers of water holes and makes use of his gun till there are no animals left to shoot. Now it appears to me that there are not insurmountable difficulties to get over and that a little local and if not sufficient, provincial legislation would make this state of affairs impossible. Let the protector of crops have his gun while his crops are in the ground and until they are reaped, which in most cases would be for four months—June, July, August and September. Let the native shikarry also have his gun for those four months as well and he will be able to pit his cunning against that of the unfortunate deer and the results of his labour will be sport and not slaughter.

(2) *The village nets.*

These nets, kept in every village inhabited by Mariahs, and in many other villages as well, are capable of catching any thing from a sun bird to a full grown Nilgai. It is probable that these are not on view in the same way when an official of the district is on tour, but in no case did they consider it necessary to put them away on my approach. I met a Mariah one day in the jungle and he explained their method of shikar with nets. Villages band together, bring out all their men and all their nets. After having arranged the nets in a run where animals pass, the jungle is beaten towards these and any flesh is good for the Mariah pot. The man told me that they had had a large beat a few days before, for miles around, but had not seen anything. It is not difficult to understand that game of all sorts under these circumstances must soon cease to exist. As far as I could ascertain the sale of flesh is not the object in these wilds, but the animals secured are divided with strict impartiality between those concerned in the beat. I was a witness of one of these partitions and the sport obtained was a jungle cat, a most unwholesome looking animal, but this was carefully divided up and put on leaves in a row. Nothing was wasted and the last of the flesh was being scraped off the cheek and carefully put aside for some one when I came up.

No doubt animal product is the property of these primitive jungle fellows, but their methods are those of extinction and if they are not restrained all animal life is bound to die out. The thriftless constructor is prevented from ruining the jungle at the expense of Government or the State and in his own interests the jungle man should be restrained from exterminating game on which he partly exists.

I also had occasion to see how birds fared at the hands of these ignorant

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

folk. Within a few miles of where I was one day camped, the pugs of a tiger had been seen in a dry water course in which there were two small pools of water where apparently the animal had drunk on the previous night. I intended to tie up in the water course and see if I could get the tiger. I went down in the afternoon and found that round the first pool branches of trees had been arranged to scare birds and prevent them from drinking there. At the second pool the same had been done and also a small hut of green boughs had been erected a few yards from the pool. In this case, however, a wet patch of sand had been left to entire thirsty birds on a sultry afternoon in the middle of the hot weather. Hidden just under the surface of the sand, was a jointed wooden frame working in the same way as a spring trap, with fine netting on either side of the frame. This frame was connected by a long cord to the hut in which the bird catcher and his son sat. By pulling the cord, any unfortunate bird up to the size of a peacock was secured the moment it put its feet on the enticing piece of wet sand. There is nothing to prevent the jungle man catching his birds in this manner and one might just as well talk to him of the evolution of the æroplane as attempt to reason with him concerning extermination. When I got up to the pool I asked to see what sport they had had and in the hands of an urchin of some 8 summers were the plucked remains of 3 unfortunate still-fluttering birds, one of which was the beautiful male *Pitta brachyura*. I put an end to their sufferings as speedily as possible. I felt it my duty, although I cannot flatter myself that it would have any lasting effect, to protest against the needless barbarity of plucking these unfortunate birds alive and after thoroughly explaining to the man my reasons, destroyed the trap. I sat up that evening and no tiger came, but the hen of this lovely thrush (*Pitta brachyura*) was hopping round picking up insects and with those dark patches like large tear drops looked as if she was mourning the cruel fate of her mate.

A plea for the Central Province buffalo.

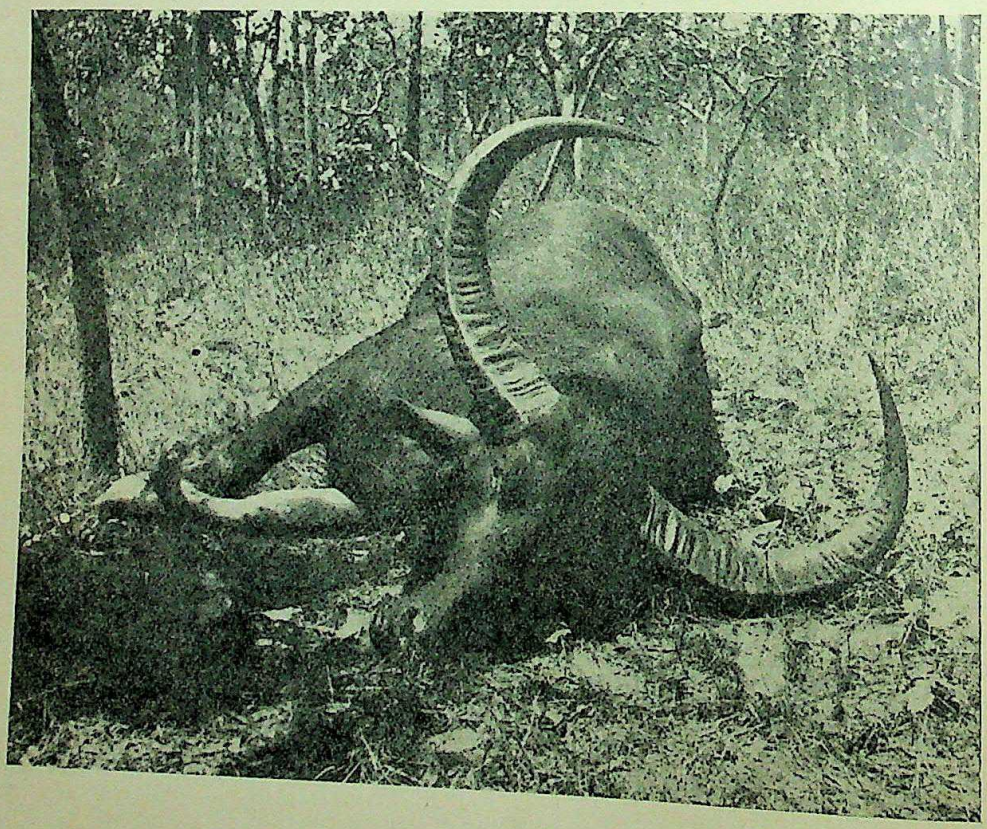
I do not think any one will dispute the fact that this splendid animal is fast disappearing and sportsmen of former years would turn in their graves were they be acquainted with the conditions that now exist.

In conversation with a well known sportsman, a forest officer, some time ago, the subject of preservation of buffalo cropped up, and I remember him saying that it was very disheartening, as a stock of these animals may have been preserved and looked after for years only to be wiped out by some cattle disease which may attack them at any time. It appears to me now that this risk might be lessened and possibly entirely avoided the part of the country frequented by these animals consists of undulating plains of grass and scrub jungle and are the grazing grounds of thousands of cattle brought into the country from the Deccan by "Banjaras" (a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

wandering tribe) at the commencement of the hot weather and they remain till the break of the rains. There is not a corner of this vast area, where there is grazing, where these men and their herds do not penetrate. If cattle disease were introduced, it would more likely emanate from these cattle than from any other source. But these wandering tribes having paid their 2 annas a head (I think it is) for each animal are at liberty to wander at will and it is difficult to disassociate poaching, theft, or any other rascality from a member of a wandering tribe, although cattle-grazing may be his ostensible means of livelihood. There are parts of a jungle where buffalo will remain throughout the year, provided they are not rudely disturbed and there are parts which they never frequent or only pass through during the rains. Knowing these areas, surely it would be possible to close those they frequent to all grazing, and the areas would not be very large. This would give the buffalo a chance, his water would be left alone and the chance of him being killed off by cattle disease would be greatly diminished. I obtained one head of the C. P. buffalo a photo of which may be considered sufficiently interesting to reproduce in the Journal. I have no intention of visiting this part of the country again, but if what I have seen, and any



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

suggestion I have made would lead to preservation of game, especially of the buffalo, I shall not have written in vain.

ST. G. de CARTERET.

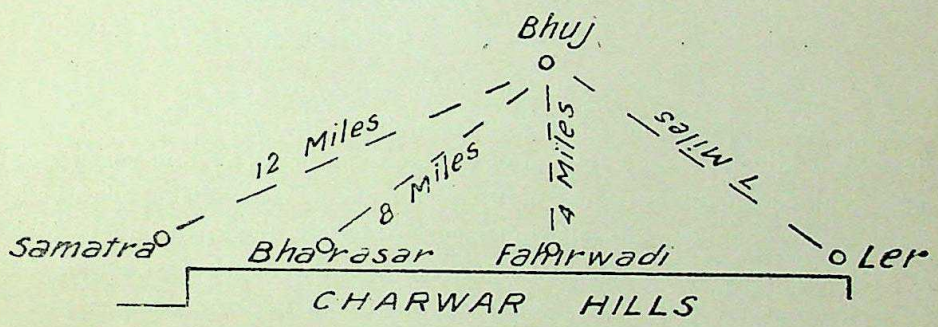
July 1912.

No. XXXIV.—NOTES ON CUTCH AMMONITES.

II

In my last notes, on the Fakirwadi Belteram beds, I drew attention to the peculiar arrangement of the hills bordering the great Cutch fault. They fall into a string of circles, semicircles and curves so much so that one is sometimes inclined to think that there is not so much fault here as a steep dive of the North side of an anticline under the later beds. However in other places the fault theory seems more probable. Possibly the formation of the fault had a good deal to do with the circling of these hills.

This 'Circling' is not confined to the Fakirwadi beds.



At each of the places named, Samatra, Bharasar, Fakirwadi and Ler I find the Ammonite ridges or hills turned in curves or circles, the North descent of the anticlines being often visible (perhaps only as a low broken off outcrop) dipping steep North and often clean gone, as if the curved hill had been shorn down across its middle by a fault.

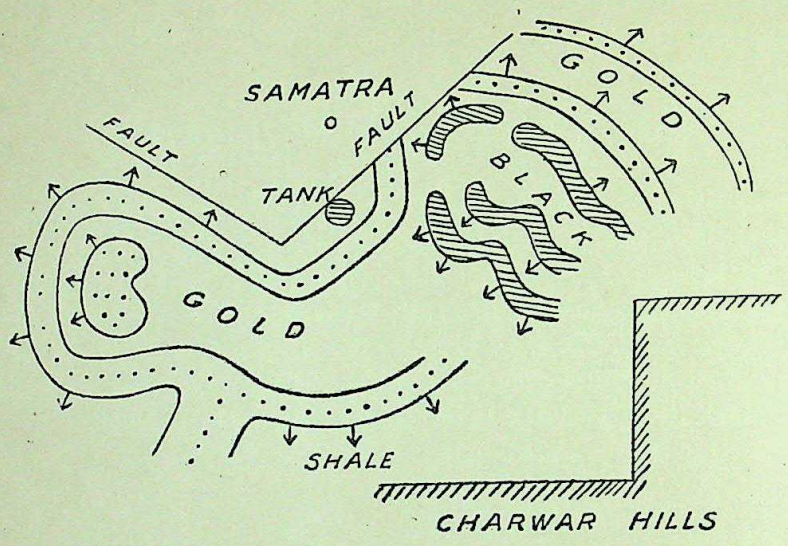
Of Ler more later : of Fakirwadi I have written : of Bharasar this much at present : the outcrop here bends round at its East extremity in a most graceful curve : you might call it the end of a stadium. The South side dives under Charwar, the East dives down Eastwards, and the North side dives down to the North for a few hundred yards and then disappears. How far the Southerly exposure extends towards Samatra, I cannot say ; I have followed it out for about 1½ miles, and it was still running Westward when I left it.

To-day I write of Samatra, which again has its circle or stadium. The shape of the Samatra outcrops of Ammonite beds is roughly this. A sort of 2 mile long stadium. Its beds dip quaquaversally, but I am not quite sure how far they extend to the South-East and South-West. All the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

West side is a plain of golden yellow soil, except where a basalt intrusion has forced up the rock (and hardened it) into a biggish pile of hills.



From this mass of hills the yellow fields and slope away to the East, till crimson black slabs come sloping up from under the yellow fields and rise into high hills at the East end of the stadium, break off into very rough and tumbled ground and sink down again below a broadish yellow belt. Here too in one place are some hummocks of basalt, the intrusion of which is probably responsible for the upheave. At the South-East corner the hills rise up and join a projecting angle of the Charwar range: but I have not yet had time to study the junction point.

To the West and South except for a South-West extension for a long way not yet mapped the wet blanket of shale-coated with small broken red stone covers up the warm yellow beds, just as it does on the South side of the Fakirwadi beds: on the North side, the line of the fault is visible, hard cold coarse sandstone dipping South, *i.e.*, against the Ammonite dip. To the East the yellow beds of Ammonite extend to some distance yet fully explored. I call the shale beds a wet blanket because you may hunt for hours in them and find nothing.* Its deposition seems to have cut off all (shelly) life.

* In a bit of coarse sandstone of the *upper* Jurassics lying apparently a fair height above the shale beds I have to-day fou d the relics of an Ammonite so perhaps *Ammonites* did struggle through the shale period: anyhow they must have done so to continue through into Cretaceou- times, unless as I sometimes think these masses of shale beds and upper jurassic sandstones are contemporary with the European cretaceous deposits. But there has been an intrusion of basalt not far off the spot, which may have carried up some of the Ammonite rocks through the overlying shale and sandstone left this waif here.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

One peculiar feature of the ground is the curve which indents the North side. There are several low parallel walls—the outcrops of the harder Ammonite strata—running along the North edge; but they curve at right angles at this point: each of them—as do also the sandstone beds to the North. There was a bad kink in the fault here.

We must then suppose that at one time the whole stadium was a vast hill; all its centre has been eroded, and has probably become much more so in the last 31 years: anyhow a very low ridge is marked in the Trigometrical Survey Map which certainly doesn't deserve a contour line, now but then other hills deserve a contour line, which do not get it.

Basalt heaved up the West end: basalt heaved up the East end. Now the hills of the East end are of crimson-black rock, weathering on their inner faces into light yellow grit, while their broad slabby backs remain black and grim as contrasted with the golden yellow of the main stadium. They are of lower, earlier, deposit: and I presume Dr. Waagen refers to these when he writes of the *Anceps* beds of Samatra. I found two or three *Anceps* among them and several other *Interrupti Perisphinctes*, which I could not name. They also contain many biggish flat broad-trimmed *Ammonites* for which I can get no satisfactory name from the list of those supplied to Dr. Waagen.

The lowest beds visible in the lowest part of the hollow of the Eastern clump of hills seem to be of a dirty white sandstone—beds lying almost level—with, it seems, no fossils. Above them belemnite bearing rocks appear: these also contain very big *Rhynchonellæ*. At one spot on the outer edge of these black rocks there is a whole swarm of these big *Rhynchonellæ*. Embedded in the black rocks on the slabby side can be seen many big specimens, much worn and inextricable. One looked to be a long ribbed *Stephanoceras*. Another specimen was a big *Aspidoceras* (as far as I could judge). Its upper surface was worn almost flat and squat with the rock: I barely noticed it: but I did and I set to work carefully and long. As I removed the surrounding matter, it broke up. On unearthing a big outer fragment, I found strong straight even ribs, which from its shape and volution pointed to an *Aspidoceras*. It was 22 inches across and I much lamented its loss.

A big *Rehmanni*† was also found not far off. Above the black rock comes the golden yellow, which I consider to be *athlete* beds for in the lower parts of the deposit I found many *athlete* fragments. There were also large numbers of *Perisphinctes rota* many *Per. dhosaensis*, great numbers of fragments of *Stephanoceras opis* (at least I can see no other *Stephanoceras* in Waagen's book to which these fragments answer): unfortunately I found no specimen with inner whirls: *Stephanoceras polyphemus, tumidum*, and *diadematum*, *Per. curvicosta*, *angigaster*, and *Indogermanus* and

† Now in the B. N. H. S. Museum: a fine big fellow.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Harpoceras eairense and *dynastes*. One well preserved *Echinolampas* (*discoides?*) was found here too; if the identification hazarded by Mr. Stone is correct, this is a rarity in so low a bed.

In the hills on the west of the Stadium there is one corner in which good specimens of *Harpoceras Dynastes* abound. And another odd feature of these West hills is the great abundance of small *Ammonites*, evidently cut off by early death: perhaps the basalt rose and poisoned or heated the water while these beds were still forming, for these seem to be the highest of the ammonite beds here exposed. Their flat slabby backs slope down to the cold red stone beyond.

There are hundreds—probably thousands—of these immature examples exposed, though the majority are in fragments. I cannot be sure yet of any having their body chamber preserved; but there is no sign of any outer whorl having covered those now exposed. I promise myself and Mr. Stone an exciting time in examining these and guessing into what class of monster each would have grown.

And so this chapter of ancient life seems to begin in a jump with plate-like *Ammonites*, *Belemnites* and big *Rhynconellæ*. Probably their ancestors lie crushed and powdered in the dirty-white rock of the lowest visible stratum. And they pass on through centuries of evolution into slightly varying forms, the old ones dying out and leaving descendants unlike themselves to start ever more widely differing branches. Suddenly while the waters are teeming with the life of these beautifully-shelled animals, there comes a bubbling up of hot or poisonous basalt. The waters get hot or poisonous and kill off all. The mud, till now flat and level, is heaved up into mounds and hills, and the whole mass is raised above water level into a small island.

One more point for notice: the Fakirwadi upper beds overlying the reefs with Samatra like species, contain many *Perisphinctes*, *Oppeliæ* and *Phyllocersa*: but the Samatra beds have not yet these upper layers: I have found none of the *Perisphinctes* so common to the upper Fakirwadi levels. (*torquatus*, *Katrolensis*, *Pottingeri*, &c.): possibly a few *Oppeliæ* in the Samatra upper beds, but so worn as perhaps to be *Harpocersa*: and one possible *Phylloceras* which refuses to budge from his compact rock-setting. So I think we may assume that these Samatra beds were clear of the water when the upper Fakirwadi beds were being laid down under water. But where did the water-line come? If it still washed the base of the hills sketched above, the *Oppeliæ*, *Phylloceras* and later *Perisphinctes* should be found under the cold red-stone shales round the edges of the raised island. This question must be solved by a close examination of the nullahs cutting through the cold red-stone shales; and this must wait a bit.

J. H. SMITH.

BHUJ, CUTCH, *July* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

P. S.—The *Nautilus* and *Ammonite* specimens have been, as far as possible, identified by reference to Dr. Waagen's work on the Jurassic Cephalopoda of Cutch. (Pal. Indica Ser. IX. 4. vol. I. Pts. 1-4.). Several specimens discovered do not seem to tally with any given in Dr. Waagen's work: these are now awaiting identification.

Among the specimens from Samatra, as yet identified by Mr. F. H. Stone, are the following :—

Belemnites grantianus[1].	Stephanoceras tumidum[3].
„ gerardi.	„ polyphemus.
„ katrolensis[2].	Perisphinctes hians[4].
„ sauvanausus.	rehmanni.
Amaltheus schaumburgi.	curvicosta.
Harpoceras dynastes.	sparsiplicatus[5].
„ lairense.	angygaster.
Peltoceras athleta.	dhosaensis.
„ bidens.	omphalodes.
	Also a Pleuromya.

NOTES :—(1) *Belemnites grantianus* is mentioned in R. D. Oldham's Manual of the Geology of India, page 224, also in a footnote on same page as having been overlooked by Dr. Waagen in Jurrassic Cutch Pal., Indica Series IX.

(2) *Bel. katrolensis* being found in these beds shows that this species had its origin earlier than was known to former surveys.

(3) *Steph. tumidum* found in upper Athleta or Dhosavolite (the dividing line is not clear to me) shows a later extension in time than was formerly believed. Dr. Waagen allocated it to *Macrocephalus* beds only.

(4) *Per. hians* also seems to continue much later than was supposed. It was formerly assigned to Putchum beds (Bathonia). Here it is found in Callorian.

(5) *Per. sparsiplicatus* was only known in Katrol beds. There is no sign of Katrol beds here.

* * *

Mr. R. C. Burton, of the Geological Survey, Calcutta, has kindly examined the large number of small Ammonites referred to in the above article. He, however, reports that the specimens are too badly preserved for safe identification. They are limonite casts. However, he is inclined to believe that several which I had marked "*Oppelia*?" are real *Oppelia*, a point which is interesting, as *Oppeliæ* are so very rare (or absent) in the Samatra beds; and these small specimens found in the upper strata may have been the præcursors of a revival of the family. Large swarms existed in the Katrol seas.

* * *

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mr. Stone has added the following to my Fakirwadi list :—

Oppelia glabella.	Perisphinctes orion.
„ bicostata.	plicatilis.
Harpoceras lunula.	frequens.
„ ignobile.	chloroolithicus.
„ lairense.	Indogermanus.
Peltoceras bidens.	præcursor.
„ athleta.	euplocus.
Aspidoceras iphiceroides.	altiplicatus.
Stephanoceras subtumuidum.	rota.
„ diadematum.	sparsiplicatus,
„ semilæve.	spirorbis.
	jooraensis.
Also Monttivaltic chariensis.	leiocymon.
	angygaster.

On the other hand, some of my indentifications (Vol. XXI. No. 2) must for the present be crossed out, *viz*:—Opp. orientalis, Harp. trilineatum and hecticum, Asp. divrsiforme and Wynnei, St. maya, macrocephalum, and fissum and Per. paramorphus.

The Fakirwadi beds extending about 250 yards horizontally thus contain *Anceps*, *Athleta*, Dhosa Oolite, Kuntkote (?), and Katrol beds.

The question naturally arises as to what formation the masses of shale and sandstone which overlie the Katrol beds (Tithonian) belong to? Dr. Waagen in the G. S. I. Records, Vol. IV., Pt. 4.. 1871, moots this problem Are they Cretaceous, and included in the 3,000 feet thick Umia beds of Mr. Vredenburg's Summary?

J. H. SMITH.

NO. XXXV.—AMMONITES FROM CUTCH.

This sketch is meant to outline the probable history of the area during the Jurassic period and later, and to explain some of the points raised by the author in his paper (page) entitled "Notes on the Cutch Ammonites."

In a Jurassic sea, the rocks containing the "Belteram" fossils were laid down. The sea was deep and little or no movement occurred in that area; *Ammonitess*, *Belemnites* and other deep-sea forms flourished and their remains were entombed where they lived.

A period of protracted earth movement began, the sea commenced to shoal slowly, allowing a deposit of fine, argillaceous material to collect over the "Belteram" beds. These conditions were probably not favourable to the existence of the *Ammonites*, &c., and they therefore moved into deeper

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

waters and to places on the deep-sea bottom where the conditions were more congenial to them and deserted the places where they formerly lived.

Occasionally, during this period of slow elevation, movement was arrested, the sea deepened and for a space, similar conditions to those that prevailed when the "Belteram" zone was being laid down, induced a few *Ammonites*, *Belemnites*, &c., to return and the remains of some of them are found where they died. The uplifting movement began afresh and the survivors fled when the argillaceous material began to envelop them again.

As the sea shallowed sufficiently to bring the area within the "Thalassia zone" of deposit, the sandstones of the Upper Charwar Age and of the Upper Jurassic Epoch were laid down over the Charwar shales.

The processes of sedimentation and movement kept pace till all the beds of Upper Jurassic age exposed within the area were laid down and then the crushing was accentuated and folding, along an axis parallel to the existing shore-line began, resulting in an anticlinal fold that was faulted along its crest when the movement became more intense.

About this time probably, the Charwar range came into being along the fault-line, as a faulted shale anticline forming a sea-cliff. Denudation removed this cliff backward, the sea encroached and planed down the shales, exposing the in-lier of "Belteram," which now formed part of the sea bottom.

Boulders were torn from these beds by the waves and dragged back and forth and left at various points of the sea bed, composed of the white Bhuj sandstones. The sea floor was finally elevated and the "Belteram" beds exposed in intimate contact with the white sandstones, along a line of fracture down throwing to Northward, that ran along the Belteram anticlinal.

As the movement became concentrated and localized along the fault, a series of domes were formed along the fold and gave rise to the line of circular hills referred to.

The fault often cuts along the crest of the fold and the fossiliferous, dark crimson, vanguard ridges, are probably the lowest beds exposed within the area.

The "Belteram" in-lier itself, forms an elongated dome, allowing the overlying Charwar shales to come in against the fault in the Nulla beyond the Barapur road.

The shales and "Belteram" beds exposed on the Bhuj side and beyond Dhonsar, are evidently the same series that form the Charwar range and "Belteram" hills, outcropping from below the Bhuj sandstones across the fault.

H. J. DAVIES, F.G.S.

CAMP LEDAUNG, 17*th August* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NO. XXXVI.—THE TRINOMIAL SYSTEM OF NOMENCLATURE.

To open any discussion on "nomenclatorial questions" is, we know, treading on exceedingly delicate ground, but the subject has recently assumed such vast importance for all Naturalists that, it is felt that the time has now come, when it can no longer be shelved.

In a very remarkable book entitled "A Hand-List of British Birds" by Hartert, Jourdain, Ticehurst, and Witherby (published by Witherby and Co., London, 1912), a most thorough attempt has been made by the authors to settle, let us *fervently* hope once and for all, the vexed question of nomenclature. Each bird has, in this work, been assigned its correct scientific name in conformity with the Rules of the International Commission of Zoological Nomenclature. That this will now lead to uniformity can hardly, we think, be doubted. The uniformity, however, to be useful must be universal, and this universality can alone be arrived at by a strict adherence to the *letter* of the Law of Priority, against which there must be no appeal. It is only too notorious that the existing confusion has hitherto arisen by authors having systematically disregarded this important principle and individual tastes and fancies thus having been given free play, the same bird has been redescribed under different names. In the circumstances is it surprising when we see in text-books a mass of synonyms tagged on to each species ?

That a large number of birds exhibit sub-species—by which term we mean not a "species in the making", but a "varietas geographica", a geographical race—will not be denied; and Ornithologists of the present day are fully alive to the great importance of the separation definitely of nearly allied forms of the same species. It is here that the Trinomial arrangement comes into play; and its use, not only helps us to speak with absolute precision of a particular race of birds, which have hitherto been binomially merged into other allied forms, but also helps to demonstrate scientifically the close relationship existing between geographical races of the same species.

The International Rules of Zoological Nomenclature clearly lay down how specific and sub-specific names shall, in the future, be accorded, and if universal uniformity is one of the desiderata, then there can no longer be any excuse for not adopting the principles everywhere. Henceforth (Article 2) the scientific designation of animals will be Uninomial for subgenera and all higher groups, Binomial for species, and Trinomial for subspecies. The Law of priority (Article 27) lays down that the *oldest* available name, even though it be inappropriate (Article 32), or "indicate characters contrary to those possessed by the animals in question" (Article 33) shall be adhered to. Doubtful cases, should any such arise, will have to be cleared by careful nomenclatures, with the help of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

International Commission, which discusses doubtful cases, and brings them up finally before the International Zoological Commission for decision. Unsightly tautonymy, such as *Apus apus apus*, or *Troglodytes troglodytes troglodytes*, is of no moment (Article 33).

As some doubts exist in regard to the use of trinomials for subspecies (geographical races), the authors of the "Hand-List" explain that when a species is divided into two or more races, or when two or more species are grouped as races of one species, then each of these races must have a trinomial appellation. It being impossible to say which is the oldest or parent form, the first named race of all those grouped under one species is, therefore, arbitrarily taken as the typical race, and its name becomes that of the species.

Applying these principles to a specific case, let us take that of the Raven as an example, and see how the revised nomenclature, in regard to the Indian birds, works out. The *typical* race of this Raven must, if it is to be distinguished from the Tibetan or Punjab birds, be designated *Corvus Corax Corax*, Linnæus. As Hodgson was the first Naturalist to describe the Tibetan race under the binomial "*Corvus tibetanus*", then this, we take it, becomes, under the new Rules, *Corvus corax tibetanus*, Hodgson Similarly as regards the Punjab Raven. Hume originally described this as "*Corvus lawrencii*", and it would now become *Corvus corax lawrencii*, Hume, and so on for other races.

This "splitting" of species will doubtless be very distasteful to the old school of "lumpers", but its advantages in leading to a more exact knowledge of the distribution of birds can hardly be overestimated. We notice that the reformed system of nomenclature has been adopted by Messrs. Baxter and Rintoul in their Report on Scottish Ornithology for 1911, and it is apparently only a question of time now before it comes into general use. That we must now all fall into line and revise our labels is inevitable, but will it be too much to hope that our Society will take early steps, in consultation with experts in Europe, to help their field workers by having the binomial system of nomenclature used by Blanford in his Aves thoroughly overhauled, and by issuing a Hand-List of revised scientific names as required by the International Zoological Congress? In such a "List" the synonymy need be as brief as possible; references being simply given, as in the "Hand-List of British Birds", to the earliest names, and the typical locality for the bird described under that name.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., *22nd August 1912*.

[We understand that a revised list of the birds of India giving the various races is in preparation by one of our members at home.—EDS.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

No. XXXVII.—CRUELTY TO WILD FOWL IN SIND.

With reference to the note on this subject by Captain C. H. Elliot in the last Journal, page 1083, and to the editorial note at the end, the following satisfactory letter has been received by the Society from Mr. A. D. Younghusband, C.S.I., I.C.S., Commissioner in Sind, dated the 27th June 1912 :—

"I have the honour to refer to correspondence ending with your letter of the 12th February 1912, on the subject of cruelty to water fowl on the Manchur Lake, which has been very fully considered and discussed with the local officers.

2. I find that the question was taken up some years ago, resulting in the extension to the locality of the provisions of Section 62 of the Bombay District Police Act (IV of 1890) and of Section 3 of the Prevention of Cruelty to Animals Act (XI of 1890), which runs as follows :—

Section 62, *Bombay Act IV, of* 1890.

Punishment for Cruelty to animals.

62 (1) Whoever cruelly beats, goads, overworks, ill-treats or tortures, or causes or procures to be cruelly beaten, goaded, overworked, ill-treated or tortured any animal, shall be punished with imprisonment which may extend to one month, or with fine which may extend to one hundred rupees, or with both.

(2) Jurisdiction in cases arising under this section shall not be exercised by a Magistrate of lower rank than the first class unless such Magistrate be specially invested with jurisdiction for that purpose by Government.

Section 3, *Act XI, of* 1890.

Penalty for cruelty to animals in public places and for sale in such places of animals killed with unnecessary cruelty.

3. If any person in any street or in any other place whether open or closed, to which the public have access, or within sight of any person in any street or in any such other place—

(*a*) cruelly and unnecessarily beats, overdrives, overloads or otherwise ill-treats any animal, or

(*b*) binds or carries any animal in such a manner or position as to subject the animal to unnecessary pain or suffering; or

(*c*) offers, exposes or has in his possession for sale any live animal which is suffering pain by reason of mutilation, starvation or other ill-treatment, or any dead animal which he has reason to believe to have been killed in an unnecessarily cruel manner,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

he shall be punished with fine which may extend to one hundred rupees, or with imprisonment for a term which may extend to three months, or with both.

3. Difficulties have however been experienced in the practical enforcement of these provisions of the law. It is one thing to be able to state that cruelty has been practised. It is another thing to produce such precise evidence against a particular individual of all the facts required to constitute a technical offence as will suffice for his conviction in a criminal court. Moreover there are certain doubtful points connected with the interpretation of the law. Such doubts can best be determined by the institution of test cases, and attention is being directed to the desirability of instituting them whenever opportunity arises.

4. It has now been arranged that in future the annual licenses granted for the capture of water fowl shall contain express conditions prohibiting all such cruel practices as that of breaking the birds' wings while alive. A proclamation is in course of issue to the public of the locality, warning them that such practices are illegal, and that the law will in future be strictly enforced against all persons resorting to them. And the local subordinate officials are being instructed to see that the warning is not disregarded.

5. The matter is one in which the co-operation of visiting sportsmen will be specially welcomed by the district authorities, and I shall be grateful if you can help, in enlisting such co-operation. It would be of the greatest assistance if any visitor under whose notice an act of cruelty may come would (1) make a full note at the time, of all relevant facts, including the names and descriptions of the offenders and of any witnesses, (2) give immediate information to the nearest Magistrate or police officer, (3) report by letter to the Collector of Larkana."

We are sure that all bird lovers and sportsmen will appreciate the action of the Commissioner in Sind in regard to the above matter, and it is hoped that all sportsmen will co-operate with the district authorities as suggested by Mr. Younghusband.

September 3, 1912. EDITORS OF THE JOURNAL.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PROCEEDINGS

OF THE MEETING HELD ON 27TH JUNE 1912.

An "At Home" of the members of the Bombay Natural History Society took place on Thursday, the 27th June 1912, Dr. A. H. Deane presiding.

NEW MEMBERS.

The election of the following 51 members since the last meeting was announced :—Capt. E. G. J. Byrne, Bombay ; Mr. E. C. H. Condon, M.I.E., A.M.I.C.E., Bandra, Bombay ; Rev. W. S. Sutherland, Kalimpong, Darjeeling ; Mr. S. H. Covernton, Larkhana, Sind ; Mr. M. T. Kennard, London ; Mr. C. Saunders, Calcutta ; Mr. J. B. Lloyd, Calcutta ; Mr. W. G. Leys, Bahraich, Oudh ; the Mess President, King's Liverpool Regiment, Lahore Cantonment ; the Principal, Larkana Madrassatul-Islam, Larkana, Sind ; the Honorary Secretary, Arthur Library, Castle Rock ; Capt. E.D.F. Kelly, England ; Mr. G. O. Allen, I.C.S., Mirzapur, U. P.; Capt. Gordon G. Jolly, I.M.S., Kacha, *via* Nushki, Baluchistan ; Mr. G. T. Barlow, Jhansi, U. P. ; Mr. Humphry Nevill, Phillaur, Punjab ; Major L. L. Maxwell, London ; Mr. G. N. Kingsford, C.E., Calcutta ; Mr. C. F. Reeve, Nasrapur, Poona Dist. ; Capt. L. A. Bethell, Dibrugarh, Assam ; Dr. S. N. Gore, L.M. & S., Agra ; Dr. J. M. O'Connell, Mannar, Ceylon ; Rev. H. Fairbank, Ahmednagar ; Mr. H. C. Robinson, Director of Museums, Kuala Lumpur, F.M.S. ; Maharaj Kumar Shri Vijayarajji, Bhuj, Cutch ; Mr. C. V. Birch, Bombay ; Lt. E. B. Fawcett, Port Blair ; Mr. John A. Wood, Kelantan, *via* Singapur ; Mrs. Leslie James, Mandalay, Burma ; Major B. E. M. Gordon, Manpur, *via* Mhow, C.I. ; Mr. A. Oliver, Swatow, China ; Rajkumar Hari Singh of Kashmir, Kashmir ; Mr. C. G. Stewart, Tharrawaddy, Burma ; Mr. Chas. Cook, Edinburgh ; Mr. H. H. M. Spink, Ahmednagar ; Capt. Norman Leslie, Darjeeling ; Major H. F. Thuiller, R.E., Ahmednagar ; Mr. L. Bishop, Hutti P. O., *via* Raichur, Deccan ; Capt. E. J. C. MacDonald, I.M.S., Balek, Abor Hills, Assam ; Mr. S. Hanhart, Bombay ; Mr. Frank E. Rice, England ; Mr. B. J. Gould, I.C.S., Gyantse, Tibet ; Mr. Alister Forbes, Bombay ; Mr. G. B. Lambert, I.C.S., Bijnor, U.P.; Mr. A. P. Kinloch, Pollibetta P.O., South Coorg ; Mr. L. P. Hutchison, Gonda, Oudh ; Mr. A. C. Tunstall, Calcutta ; Miss Annie L. Skinner, Honorary Secretary and Treasurer, Natural History Society of Malaya, Kuala Lumpur, F.M.S. ; Mr. J. C. Stodart, I.C.S., Pollachi, Coimbatore Dist. ; Capt. W. Paget Tomlinson, Bangalore ; and Mrs. T. W. Birkett.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contribution.	Locality.	Donor.
1 Urial, *Ovis vignei* (alive) .. 1 Four-horned sheep, *Ovis aries* (alive).	Persia ..	Capt. F. W. Townsend.
8 Takin, *Budorcas taxicolor*, heads.	Mishmi Hills ..	Capt. F. M. Bailey.
1 Unicorn Sheep, *Ovis aries* ..	Khatmandu, Nepal	Lt.-Col. J. Manners-Smith.
2 Wolves, *Canis pallipes* .. 7 Jungle Cats, *Felis affinis* .. 1 Common Indian Civet, *Viverricula malaccensis*. 2 Jackals, *Canis indicus* .. 1 Mungoose, *Mungos mungo* .. 8 Hares, *Lepus ruficaudatus* ..	Siripur, Saran ..	Mr. M. Mackenzie.
Skin and skull of Hybrid Lion and Panther.	Kolhapur Gardens.	Col. F. Wodehouse.
1 Clouded Leopard, *Felis nebulosa*.	Sadon, Shan States.	Mr. Chas. Gray.
1 Skull of Lion, *Felis leo* ..	Junagadh Gardens.	Mr. L. Robertson, I.C.S.
1 Leopard Cat, *Felis bengalensis*.	Mongnai, Shan States.	Mr. L. E. C. Evarard.
1 Jungle Cat, *Felis affinis* .. 4 Skulls of Desert Fox, *Vulpes leucopus*.	Ferozepore. ..	Mr. H. Whistler.
1 Jungle Cat, *Felis affinis* 1 Fishing Cat, *Felis viverrina*	Motihari, Champaran.	Mr. J. S. E. Walker.
1 Jungle Cat *Felis affimis* ..	Chakdara ..	Capt. H. Graham.
*2 Chital, *Axis axis* (alive) ..	Kanara ..	Mr. G. C. Shortridge.
1 Bear Cat, *Ælurus fulgens* ..	Silchar ..	Mrs. F. E. Jackson.
2 Jakals, *Canis indicus* .. 1 Hyæna, *Hyæna hyæna* ..	Akola, Berar ..	Mr. C. H. Dracott.
1 Wild Boar, *Sus cristatus* (variety.) 1 Jackal, *Canis indicus* ..	Cutch ..	H. H. Rao of Cutch.
4 Tiger, *Felis tigris* Cubs, fœtal specimens.	Mudhol ..	H. H. The Rao Saheb of Mudhol.
6 Hares, *Lepus nigricollis* ..	Nilgri Hills ..	Mr. Chas. Gray ..
1 Ratel, *Mellivora indica*. ..	Hoshangabad ..	Capt. W. F. Maxwell.
1 Black Buck, *Antilope cervicapra*.	Wadhwan ..	Mr. S. A. Stripp.
6 Bats, *Rhinolophus affinis* ..	Khatmandu ..	Lt.-Col. J. Manners-Smith.
8 Bats, *Scotophilus khuli* ..	Pusa ..	Mr. T. Bainbrigge Fletcher.
2 Spot-billed Ducks, *Anas pœcioerhyncha haringtoni*.	Taunggyi ..	Major H. H. Harington.

*Forwarded to the Victoria Gardens, Bombay.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Contribution.	Locality.	Donor.
1 Stiff-tailed Duck, *Erismatura leucocephala.*	Srinagar ..	Mr. M. T. Kennard.
1 Mallard-Shoveller (hybrid)	Chingleput ..	Mr. I. S. Fraser.
1 Swinhoe's Snipe, *Gallinago megala.*	Dinvi Vanam, Madras.	Mr. R. F. Stoney.
1 Swinhoe's Snipe, *Gallinago megala.*	Khatmandu ..	Lt.-Col. J. Manners-Smith.
1 Common Hill Partridge, *Arboricola torqueola.*	Bhutan, Duars ..	Mr. H. V. O'Donel.
3 Eastern Bayas, *Ploceus passerinus.*	Wardha	Lt. W. A. Tucker.
3 Blue Winged Teal, *Querquedula circia.*	Bandra	Mr. Windgate.
1 Barn Owl, *Strix flammea* ..	Srinagar	Hon'ble H. G. O. Bridgeman.
19 Duck Skins of various species..		
3 Eggs of Grey Jungle Fowl, *Gallus sonnerati.*	Chanda	Mr. A. H. A. Simcox, I.C.S.
1 Egg of Bengal Florican, *Syphœtis bengalensis.*	Hasimara, Duars .	Mr. H. V. O'Donel.
1 Nest of the Tailor Bird, *Orthotomus sutorius.*	Dinapur	Major J. W. L. Elgee.
1 Nest of the Purple Sun Bird, *Arachnechthra asiatica*		
2 Bird's Nests	Lucknow.. ..	Mr. J. Florence.
A large number of Fishes and Crustaceans.	Persian Gulf ..	Capt. W. F. Townsend.
2 Snakes, *Typhlops porrectus* ..	Alipore	Major O. A. Smith.
1 Cobra, *Naia tripudians* ..		
4 Common wolf Snakes, *Lycodon aulicus.* 3 Brown Tree Snakes, *Dipsadomorphus trigonata.* 1 Chequered Water Snake, *Tropidonotus piscator.* 1 Common Krait, *Bungarus cœruleus,* 1 *Hypserhina sieboldi* and 4 Skins.	Pusa	Mr. T. Bainbrigge Fletcher.
Head of a King Cobra, *Naia bungarus,* which measured 16 ft. 4 ins.	Quilon	Capt. F. H. Branson.
5 Snakes and 3 Scorpions ..	Pasighat, Abor. Country.	Capt. R. S. Kennedy.
1 Johns Earth Snake, *Eryx johnii* (alive).	Ootocamund ..	Mr. C. B. Antram.
1 King Crab, *Limulus* sp.. ..	Akyab	Comdr. A. R. G. Willock, R.I.M.
22 Fresh Water Sponges ..	Various	Indian Museum, Calcutta.
A few Fresh Water Medusa ..	Satara	Do.
A number of Shells and Fossils..	Persian Gulf, Mekran Coast.	Capt. F. W. Townsend.
35 Butterflies	Nigiris	Capt. G. A. Hare.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Minor contributions.—Messrs. J. P. Paterson, Chas. Gray, C. Beadon, K. C. Macdonald, Capt. Massey, Mir S. Ali, C. E. Traylen, Major H. Robertson and Mr. P. F. Gomes.

MAMMAL SURVEY.

Grant from Bombay Government.

The Secretary announced that he had just received a letter from the Government of Bombay intimating that Government had been pleased to sanction a special grant of Rs. 2,500 towards the funds for the Mammals Survey.

The survey is progressing satisfactorily. Mr. Crump is at present at Chanda, C. P., and Mr. Shortridge in Mysore.

The Superintendent, Victoria Gardens, Bombay, exhibited some plants of *Hæmanthus multiflorus* in flower.

The Secretary exhibited a plant of *Peristeria elata*, the 'Dove' Orchid, in flower.

An "At Home" of the members of the Bombay Natural History Society took place on Thursday, the 26th of September 1912, Mr. T. R. Bell, I.F.S., presiding.

The election of the following 37 members since the last meeting was announced:—Mr. G. M. McCleverty, Dehra Dun, U. P.; Mr. E. Lane, Koderma, P. O.; Mr. W. E. Kidner, R. E., Bombay; Mr. G. N. Frattini, Bangalore; Dr. E. H. Hankin, Agra; Mr. H. Gill, Kallini P. O., Cachar; Capt. W. G. Meale, I.A., Mount Abu; Mr. W. W. Phillips, I.C.S., Madras; The Librarian, Gauhati Club, Assam; Mr. Aga Shah Rookh Shah, Poona; Mr. Carl Meyer, Rangoon; Capt. C. H. Barbar, I.M.S., Banda, U. P.; Dr. A. D. Cunnyngham Perdriau, Narsinghpur, C. P.; The Mess Secretary, R. A. Mess, Meerut; Major H. N. Holden, Jaipur, Rajputana; Mr. B. L. Clarke, Quetta; the Honorary Secretary, R. A. Mess, Cambellpore; Major James Davidson, I.M.S., D.S.O., Dehra Dun, U. P.; Mr. E. D. Knowles, Purulia, B. N. Ry.; Mr. T. R. Rearden, England; Capt. T. L. Bomford, I.M.S., Calcutta; The Mess President, The Border Regiment, Maymyo; Mr. E. H. P. Jolly, I.C.S., Jalgaum; Mr. E. Ferry, Benares; Mr. E. L. Mahon, Pollibetta, South Coorg; The Principal, Madras Forest College, Coimbatore; Major A. D. Kirby, R.F.A., Allahabad; Mr. H. Jouquet, Dehra Dun, U.P.; Mr. F. C. Chamier, I.C.S., Mirzapur; Mr. E. A. Macnee, Jubbulpore, C. P.; Mr. T. J. Tasker, I.C.S., Hospet, Dist. Bellary; Mr. S. H. Harman, Tavoy, L. Burma; Mr. J. W. Bradly, Katha, Burma; Mr. V. A. Mackinnon, Mussoorie, U. P.; Mr. Donald Fraser, Bombay; Mr. B. S. Hickey, Tateriah P. O., Champarum and Mr. A. W. Botham, I.C.S., Shillong.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting :—

Contribution.	Locality.	Donor.
Panther (black variety) *Felis pardus.*	Siam	Mr. J. F. Keddie.
Desert Cat, *Felis ornata*	Cutch	H. H. The Rao of Cutch.
Burmese Civet Cat, *Viverra megaspila.*	Shan States ..	Mr. L. E. C. Everard.
1 Wolf, *Canis lupus*	Gumal, Baluchistan.	Lt.-Col. H. C. Bernard.
1 Tree-Shrew, *Tupaia* sp.? ..	Bhutan, Duars ..	Mr. H. V. O'Donel,
2 Large brown Flying squirrels, *Petaurista inornatus.* 4 Small Kashmir Flying squirrels, *Sciuropterus fimbriatus.* 1 Parti-coloured Flying squirrel, *Sciuropterus alboniger.* 8 Rats, *Epimys vicerex,* 1 Persian house mouse, *Mus bachtrianus* and several shrews and bats in spirit.	Simla	Mr. P. T. L. Dodsworth.
2 Squirrels, *Scuirus pernyi* ..	Siam	Mr. E. B. Howell.
15 Voles and Mice ..	Kashmir	Lt.-Col. H. A. F. Magrath.
2 Black naped Hares, *Lepus nigricollis.*	Coimbatore ..	Mr. C. E. C. Fischer.
Deformed head of Gaur, *Bibos gaurus.*	Kanara	Conservator of Forests, C. C.
2 Young Baral heads, *Ovis burrhel.*	Garhwal	Mr. J. C. Pickersgill Cunliffe.
6 Bird skins ..	Bhutan, Duars ..	Mr. H. V. O'Donel.
Masked Booby, *Sula cyanops* ..	Bombay Harbour.	Mr. E. R. H. Jockson.
White winged Wood Duck, *Asarcornis scutalatus.*	Siam	Mr. J. F. Keddie.
Scully's Wood Owl, *Syrnium indrani.* Eggs and nest of Orange Bullfinch, *Pyrrhula aurantiaca* and nest of Sooty Flycatcher, *Hemichelidon sibirica.*	Kashmir	Lt.-Col. H. A. F. Magrath.
2 Bird's Nests and Eggs ..	Garhwal	Mr. J. C. Pickersgill Cunliffe.
Eggs of Koklas Pheasant, *Pucrasia macrolopha.*	Jansar	Mr. A. Rodgers.
2 Young Monitors, *Varanus sp.?* ..	Ceylon	Mr. F. H. S. Stone.
Head of King Cobras, *Naia bungarus.*	Thayetmyo ..	Mr. A. Bailey.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Contribution.	Locality.	Donor.
2 Young King Cobras, *Naia bungarus.* 1 Golden Tree Snake, *Chrysopelea ornata* and one black Krait, *Bungarus lividus.*	Tindharia ..	Mr. A. Wright.
6 Snakes ..	Sholapur.. ..	Mr. R. E. Macpherson.
1 Painted Tree Snake, *Chrysopelea ornata.* 1 Brown Tree Snake, *Dipsadomorphus trigonata.*	Kadra, Rajputana.	Mrs. Hume.
2 Snakes ..	Sikkim	Mr. C. H. Dracott.
11 Snakes ..	Jalpaiguri ..	Mr. W. L. Travers.
3 Snakes ..	Ootacamund ..	Mr. C. B. Autram.
Chameleon, *Chamelon calcaratus* (alive).	Nadiad	Mr. T. N. Jhaneri.
Young Hawks bill turtle, *Chelone imbricata* (alive).	Karachi	Capt. F. W. Townsend.
17 Fish and several other Lizards and spiders.	Charbar, P. Gulf.	Mr. W. D. Cumming.
1 Small crocodile, *Crocodilus porosus* (alive).	Kanara	Mr. G. C. Shortridge.
A number of frogs and toads ..	Simla	Mr. P. T. L. Dodsworth.
A number of insects ..	Singapore ..	Mr. F. H. Stone.
A large number of Butterflies ..	Nilgiri Hills ...	Capt. G. A. Hare.
Do. do. ..	Sikkim	Mr. C. H. Dracott.
A large number of Beetles ..	Charbar, P. Gulf..	Mr. W. D. Cumming.
Beetles and other insects ..	Maymyo ..	Capt. S. Pershouse.
Corals ..	Singapore ..	Mr. F. H. Stone.

Minor contributions from Messrs. S. A. Stripp, H. M. Dwane, H. V. O'Donel, E. Comber, J. F. Keddie, H. White, L. Bishop, L. Newton Davis, I.M.S., P.M.D. Sanderson, L. Robertson, W. R. Clarke, P. Gomes and J. F. Lopez.

MAMMAL SURVEY.

The Secretary said since the last meeting Mr. Crump had sent in 227 specimens from Chanda, C. P., and Mr. Shortridge 106 specimens from Shimoga and 331 from Vijayanagar (Humpi), Bellary District. Mr. Crump was now in Kathiawar collecting and Mr. Shortridge at Kolar, E. Mysore, from whence he proceeds to Coorg and the Malabar Coast. In regard to finances, the Government of India had kindly responded to the Society's appeal by giving them Rs. 7,500, which was very acceptable but would unfortunately not permit the Society to bring out a third collector, a very desirable course if the Survey was not to drag on for the next five years.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

EXHIBITS.

Mr. Kinnear exhibited the specimen of mammals which had been named and returned by the British Museum.

The Secretary exhibited the following flowering plants new to Bombay :— *Mussænda erythrophylla* from Central Africa with bright crimson bracts (in contrast to the white bracts of the indigenous *M. frondosa*), *Solanum pensile* with violet and yellow flowers and *Odontodenia harrisi* with large pale yellow flowers and a salmon centre.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CONTENTS OF THIS NUMBER—(*contd.*).

PAGE

MISCELLANEOUS NOTES—*contd.*

V.—Notes on the time of appearance and flight of Eastern Bats. By G. C. Shortridge 1321

VI.—The Habits of Voles. By Lt.-Col. H. A. F. Magrath. 1322

VII.—The Indian Buffalo (*Bubalus bubalis*). By G. C. Shortridge 1323

VIII.—Tsine (*Bibos sondaicus*) consorting with tame Cattle. By Major G. P. Evans 1323

IX.—Habits of the Kashmir Stag (*Cervus kashmiriensis*) in Summer. By Lt.-Col. H. A. F. Magrath 1325

X.—Abnormal type (?) of Eggs of the Little Forktail (*Microcichla scouleri*, Vigors). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1327

XI.—Nesting of the Western Blue Rock Thrush (*Petrophila cyanus* Linn) in the neighbourhood of Simla, N. W. Himalayas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1328

XII.—The Himalayan Greenfinch (*Hypacanthis spinoides*). By Lt.-Col. H. A. F. Magrath 1329

XIII.—Early arrival of the Grey Wagtail. By J. Donald, I.F.S. 1329

XIV.—Eggs of the large Hawk-Cuckoo (*Hierococcyx sparverioides*). By A. E. Osmaston..... 1330

XV.—Question whether *Gypus fulvus*, Gmelin, the Griffon Vulture, occurs in the Himalayan districts of the Punjab? By P. T. L. Dodsworth, F.Z.S., M.B.O.U... 1331

XVI.—A Kite's Larder. By P. T. L. Dodsworth, F.Z.S., M.B.O.U. 1332

XVII.—Tameness of great Indian Bustard (*Eupodotis edwardsi*). By R. Teague Jones, Indian Police 1333

XVIII.—Bustard in Kathiawar. By Major J. R. Carter 1333

XIX.—The great Indian Bustard (*Eupodotis edwardsi*). By A. B. Aitken..... 1334

XX.—The Masked Booby (*Sula cyanops*) in Bombay Harbour. By N. B. Kinnear 1334

XXI.—Baikal or Clucking Teal (*Nettium formosum*). By A. B. Aitken 1335

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Bombay Natural History Society.

OFFICE-BEARERS, LIFE MEMBERS, HONORARY CORRESPONDING MEMBERS AND MEMBERS ON 1st JULY 1911.

LIST OF OFFICE-BEARERS.

President.

H. E. The Right Honourable Lord Sydenham, G.C.M.G., G.C.I.E., G.C.S.I., F.R.S.

Vice-Presidents.

Mr. J. D. Inverarity, B.A., LL.B. | Rev. F. Dreckmann, S.J.
The Hon'ble Mr. N. C. Macleod.

Hon. Secretary.

Mr. W. S. Millard.

Hon. Treasurer.
Mr. L. H. Savile.

Hon. Librarian.
(*Vacant.*)

Hon. Editors.

Mr. W. S. Millard.
Mr. R. A. Spence. | Mr. N. B. Kinnear.

Managing Committee.

Revd. J. Assmuth, S.J.
Mr. T. Bainbrigge Fletcher, F.E.S.
Mr. T. R. Bell, I.F.S.
Mr. C. L. Burns.
Mr. E. Comber, F.Z.S.
Lt.-Col. G. H. Evans, C.I.E., F.L.S.
Capt. W. H. Evans, R.E.
Prof. G. A. Gammie.
Mr. E. E. Green, F.E.S.
Mr. F. Hannyngton, I.C.S.
Mr. G. S. Hardy, I.C.S.
Mr. N. B. Kinnear.
Lt.-Col. K. R. Kirtikar, I.M.S.
Major W. G. Liston, C.I.E., I.M.S.
Mr. J. McNeill, I.C.S.
Dr. A. Powell.
Mr. E. L. Sale, I.C.S.
Mr. R. A. Spence.
Major F. Wall, I.M.S., C.M.Z.S.
Mr. John Wallace, C.E.

1st Section.—(*Mammals and Birds.*)
President—Mr. J. D. Inverarity, B.A., LL.B.
Secretary—Mr. E. Comber, F.Z.S.

2nd Section.—(*Reptiles and Fishes.*)
President—Rev. F. Dreckmann, S.J.
Secretary—Major F. Wall, I.M.S., C.M.Z.S.

3rd Section.—(*Insects.*)
President—Mr. H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S.
Secretary—(*Vacant.*)

4th Section.—(*Botany.*)
President—Professor G. A. Gammie, F.L.S.
Secretary—Lt.-Col. K. R. Kirtikar, I.M.S. (retd.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Bombay Natural History Society.

LIST OF MEMBERS.

Life Members.

Aga Khan, H. H. Aga Sultan Mahomed Shaha ... Bombay.
Austra, H. I. H. the Archduke Franz Ferdinand... *Europe.*

Baker, E. C. Start (E.Z.S., M.B.O.U.) ... *Europe.*
Balcrishna Venayek Wassoodew (B.A.) ... Bombay.
Baroda, H. H. the Maharaja Sir Sayaji Rao, (G.C.S.I.) Gaekwar of ... ... Baroda.
Barton, E. L. ... ... *Europe.*
Beale, H. F. .. .. Bombay.
Bell, H. F. E. (I.C.S.) ... ... Mandla, C. P.
Bhownagar, H. H. the Maharaja Sir Bhosingji (G.C.S.I.) ... ... Bhownagar.
Bhurie Singh, H. H. Sir (K.C.S.I., C.I.E.) ... Chamba.
Bikaneer, H. H. Major Sir Gunga Sinji (G.C.S.I.), Maharaja of ... ... Bikaneer.
Burder, H. C. ... ... *Europe.*
Bute, Marquis of ... ... *Scotland.*

Caccia, A. M. (I.F.S.) ... ... *Europe.*
Cama, Dr. Maneckji D. ... ... Bombay.
Campbell, Capt. D.... ... . *Europe.*
Cassamalli Jairajbhoy Peerbhoy ... ... Bombay.
Clarke, L. O. (I.C.S.) ... ... Nowgong.
Coltart, Dr. H. N. ... ... Samastipur, T.S.Ry.
Coode, J. M. ... ... *Europe.*
Cowie, Rev. A. G. G. ... ... Rawal Pindi.
Craw, H. H. (I.C.S.) ... . Rangoon.
Cursetji, Khan Bahadoor C. M. ... ... Bombay.
Cutch, H. H. Sir Shri Kengurji Sawai Bahadoor, (G.C.I.E.), Rao Saheb of ... ... Cutch.

Davidson, Major J. (I.M.S., D.S.O.) ... ... Dehra Dun.
Dawson, W. H. (I.C.S.) ... ... *Europe.*
Dhar, H. H. Raja of ... ... Dhar.
Dhunjibhoy Bomanji ... ... Bombay.
Drake-Brockman, Lt.-Col. H. E. (I.M.S.) ... Bombay.
Duxbury, Capt. C. D. ... ... Mhow, C.I.

Foulkes, Major T. H. (I.M.S.) ... ... Madras.
Fulton, Capt. H. T. (D.S.O.) ... ... Dehra Dun, U.P.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Gammie, Professor G. A. ... ... Poona.
Gonsalves, A. F. ... ... Banora.

Habbibudin, S. (N.C.S.) ... ... Hyderabad, Deccan.
Hide, P. ... ... *Europe.*
Hill, Capt. R. D. O. ... ... Chitral.
Holkar, H. H. the Maharaja Tukuji Rao ... Indore.
Husbands, H. W. S. ... ... Hingoli, Deccan.
Hyam, Judah (G.B.V.C., F.Z.S.) ... ... Pusa, Bengal.

Ichalkaranji, The Hon'ble Meherban Narayenrao Govind, *alias* Babasaheb Ghorpade, Chief of .. Kolhapur.
Idar, Maharaj Kumar Major Dowlatsingh ... Idar. [Darbhanga.
Inglis, C. M. ... ... Lahiria-Sarai, P. O.
Inverarity, J. D. (B.A., LL.B.) ... ... Bombay.
Ivens, J. H. ... ... Agra.

Jamkhandi, Shrimant Parashram Ramchandra Patwardhan, The Chief of ... ... Kolhapur.
Janjira, H. H. Sir Sidi Ahmed Khan, Nawab of ... Janjira

Kagal, Meherban Piraji Rao Bapoo Saheb Ghote, Chief of ... ... Kagal, S. M. C.
Khan, Muncherji Framji ... ... Bombay.
Kolhapur, H. H. Sir Shahu Chhatrapati, The Maharaja of (G.C.S.I., G.C.V.O.) ... ... Kolhapur.
Kotah, H. H. Sir Umed Sing Bahadoor, K.C.S.I., the Maharaja of ... ... Kotah.

Lamb, The Hon'ble Mr. R. A. (I.C.S., C.I.E.) ... Bombay.
Lee, D. H. ... ... *Europe.*
Long, G. R. (I.F.S.) ... ... Rangoon.

Manavadar, Khan Shree Fatehdin Khan, Chief of... Kathiawar.
Manders, Lieut.-Col. N. (R.A.M.C.) ... ... Colombo, Ceylon.
Mandlik, Narayan Vishvanath ... ... Bombay.
Marshall, Arch. McL. ... ... *Europe.*
Marshall, J. McL. ... ... *Europe.*
Martin, Col. Gerald... ... ... *Europe.*
Masani, A. M., Curator, Baroda State Museum ... Baroda.
Millard, W. S. (F.Z.S.) ... ... *Europe.*
Mills, J. D. ... ... *Europe.*
Miraj, Shrimant Gungadharrao Ganesh, *alias* Babasaheb Patwardhan, Chief of ... ... *Europe.*
Monteath, G. (I.C.S.) ... ... Karwar, Kanara.
Mosse, Capt. A. H. E. (I.A.) ... . Bhuj, Cutch.
Mysore, H. H. Krishna Raj Woodayar Bahadoor, the Maharaja of (G.C.S.I.) ... ... Mysore.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Naraenji Dwarkadas	... Bombay.
Narotum Morarji Goculdas	... Bombay.
Nurse, Lieut.-Col. C. G., (F.E.S.) ...	... *Europe.*
Ogilvie, G. H. (I.F.S.)	... Rangoon.
Olivier, Col. H. D. (K.E. F.Z.S.) ...	... *Europe.*
Patiala, H. H. Maharaja of	... Patinda.
Pestonji Jivanji (N.C.S.)	... Hyderabad, Deccan.
Petit, Bomanji Dinshaw	... Bombay.
Petit, Dhunjibhoy Bomanji	... Bombay.
Petit, Jehangir Bomanji	... Bombay.
Phipson, H. M. (F.Z.S.)	... *Europe.*
Pickersgill-Cunliffe, Lieut. J. C. ...	... Jhansi.
Poncins, Baron Edmond de	... *Europe.*
Rae, Capt. M. E.	... Chitral.
Ravenshaw, Col. C. W.	... *Europe.*
Roberts, Lieut.-Col. M. B.	... *Europe.*
Ross, Major Tyrell...	... Lucknow.
Sangli, Shrimant Chintamanrao Appasaheb Patwardhan, Chief of Sangli	... Sangli, S. M. C.
Scindia, H. H. The Maharaja, Sir Madhowrao (G.C.S.I., G.C.V.O.)...	... Gwalior.
Seton-Karr, H. W....	... *Europe.*
Spooner, T. J. (C.E.)	... Poona.
Standen, B. (L.C.S.)	.. Pachmarhi, C. P.
Tata, Sir Dorabji J.	... *Europe.*
Tata, R. J.	... Bombay.
Tejpal, Goverdhundas Goculdas ...	... Bombay.
Tilly, T. H.	... Rangoon.
Travancore, H. H. the Maharaja Sir Sultan Rama Raja Bahadoor (G.C.S.I., G.C.I.E.) ...	... Trivandrum.
Ulwar, H. H. Sawai Jey Singh Bahadoor, the Maharaja of	... Ulwar.
Unwalla, J. N.	.. Bhownagar.
Vanghan, W. (F.E.S.)	... Ceylon.
Venning, Capt. F. E. W.	... Myitkyina, Burma.
Venour, Major W. E.	... Kohat.
Whitehead, Major J. H.	... Mandalay.
Whitworth, G. C. (I.C.S.)	... *Europe.*
Wroughton, R. C. (F.Z.S.)	... *Europe.*
Yerbury, Col. J. W.	... *Europe.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Honorary Corresponding Members.

Heeckerenez, Le Baron Von... ... ... *Europe.*
Kerthoven, E. J. ... ... *Java.*

Members.

Abbay, Capt. B. N. ... ... Myitkyina, Burma.
Abbott, R. G. ... ... Bombay.
Abbott, Capt. S. H. L. (I.M.S.) ... ... Dalhousie, Punjab.
Abu High School, The Honorary Secretary ... Mt. Abu, Rajputana.
Acworth, E. C. B. ... ... Bombay.
Adam, J. ... ... Lucknow.
Adam, J. B. Mercer (I.F.S.) ... ... Moulmein, Burma.
Adams, R. M. ... ... Peshawar.
Addison, Capt. A. M. ... ... Rawalpindi.
Aga Khan, His Highness Aga Sultan Mahomed Shah (*Life Member*) ... ... Bombay.
Aga Shah Rook Shah ... ... Poona.
Agharker, Shankar Purshotum ... ... Bombay.
Ahmedabad P. R. Training College, Principal ... Ahmedabad.
Ainslie, Major H. P. ... ... Kamptee, C. P.
Ainsworth, Major H. (I.M.S.)... ... ... *Europe.*
Aird, J. ... ... Nilgiris.
Aitchison, D. ... ... Madras.
Aitchison, P. E. (I.F.S.) ... ... Belgaum.
Aitken, A. B. ... ... Quetta.
Aitken, C. E. ... ... Mirpurkhas.
Aiyar, L.... ... ... Ranipet, N. Arcot.
Allan, C. W. (B.F.S.) ... ... Henzada, Burma.
Allen, G. O. (I.C.S.) ... ... Mirzapur, U. P.
Alston, G. C. ... ... *Europe.*
Alwar, H. H. Maharaja Sawai Jaisingh Bahadur, K.C.S.I., K.C.I.E. (*Life Member*) ... ... Alwar, Rajputana.
Ameerudin Tyabjee... ... ... Bombay.
American Museum of Natural History ... ... New York.
Anderson, A. ... ... Quetta.
Anderson, C. W. B. ... ... Rangoon.
Andrew, G. P. (I.C.S.) ... ... Mergui, Burma.
Andrews, Capt. S. G. ... ... Malta.
Andrewes, H. Leslie ... ... Guynd, P.O. Nilgiris
Annandale, Dr. N.... ... ... Calcutta.
Annesley, F. C. ... ... Bombay.
Anstead, R. D. ... ... Bangalore.
Antram, C. B. (F.E.S.) ... ... Ootacamund.
Appleford, W. P. ... ... Kashmir.
Archibald, W. ... ... Rangoon.
Archer, Lt.-Col. C. (C.I.E.) ... ... Quetta.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Armstrong, S. ... ... *Europe.*
Arnould, F. G. ... ... Broach, B. B. & C. I. Ry.
Arthur, D. (I.M.S.) ... ... China.
Arthur Library, The Honorary Secretary ... Castle Rock
Ash, H. D. ... ... Bombay.
Assmuth, Rev. J. (S.J.) ... ... Bombay.
Aspinwall, J. E. ... ... Bombay.
Atkins, C. H. (I.C.S.) ... ... *Europe.*
Atkins, E. R. ... ... Raheng, Siam.
Atlay, F. ... ... Mogok, Burma.
Australian Museum, The Secretary ... ... Sydney.
Austria, H. I. H. the Archduke Franz Ferdinand (Life Member) ... ... *Europe.*

Backhouse, B. H. ... ... Europe.
Bacon, A. L. ... ... Mogok.
Bagnall, Lieut. R. ... ... Lucknow.
Bagshawe, L. V. ... ... Pyamtaza.
Bailey, Capt. F. M. ... ... Sadiya.
Baker, C. D. ... ... Bombay.
Baker, E. C. Stuart (F.Z.S.) (*Life Member*) ... *Europe.*
Baker, Major H. R. ... ... Cannanore.
Baker, P. M. (B.Sc., A.M.I.M.E., A.M.I.E.E.) ... Bombay.
Bale, Sons & Danielsson, Ld., Messrs. John ... *Europe.*
Balding, C. J. ... ... Panposh.
Balfour, K. M. ... ... Jhansi, U. P.
Balkrishna Venayok Wassoodew (B.A.) (*Life Member*) ... ... Bombay.
Ball, H. P. ... ... Bombay.
Ballantine, W. J. H. ... ... Sadiya, Assam.
Balston, Capt. G. R. ... ... Mhow, C. I.
Bamber, Col. C. J. (F.L.S., I.M.S.) ... ... Simla.
Banatvala, Lt.-Col. H. E. (I.M.S.) ... ... Nagpur.
Bannerman, Surgeon-General W. B. (C.S.I., I.M.S.) Madras.
Bapat, S. K. ... ... Karwar, Kanara.
Barker, C. C. ... ... Tezpur.
Barker, P. W. ... ... Neeschindipur, E. B. S. Ry.
Barkley, Mrs. L. G. M. ... ... Ceylon.
Barlee, K. W. (I.C.S.) ... ... Bombay.
Barlow, G. T. ... ... Jhansi.
Barlow-Poole, B. H. (I.F.S.) ... ... Kurnool.
Barnes, B. D. ... ... Bombay.
Barnett, Capt. W. H. ... ... Haka, Chin Hills, Burma.
Barnett, W. G. ... ... Saugor, C. P.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Baroda, H. H. the Maharaja Sir Sayaji Rao Gaekwar of (G.C.S.I.) (*Life Member*) ... ... Baroda.
Barrett, Capt. F. W. ... ... Lucknow.
Barrington A. H. M., (A.C.F.) ... ... Rangoon.
Barron, Lt. A. H. D. ... ... Manipur.
Barron, P. A. R. ... ... Bangkok.
Barrow, Col. H. J. Waller (R.A.M.C.) ... ... *Europe.*
Barton, C. S. ... ... Burma.
Barton, E. L. (Life Member) ... ... *Europe.*
Batten, Dr. C. Clifford .. .. *Europe.*
Battie, J. S. (I.F.S.)... ... ... Trichinopoly.
Battye, Major W. R. (I.M.S.)... ... ... Udaipur, Rajputana.
Baumbach, R. ... ... Pachmarhi, C. P.
Baxter, N. B. ... ... Poona.
Bayley, Hon'ble Sir Chas. (KT., I.C.S., K.C.S.I., G.C.I.E.) ... ... Ranchi.
Bayley, Major F. G. ... ... *Europe.*
Beadnell, C. B. ... ... Calicut.
Beadon, W. R. C. (F.G.S.) ... ... Tavoy, L. Burma.
Beale, H. F. (*Life Member*) ... ... Bombay.
Beamish, H. E. ... ... Rangoon.
Beaumont, T. L. F. ... ... Karachi.
Beazley, W. E. ... ... Kohat.
Beebe, C. William ... ... America.
Beechey, A. St. V. (I.F.S.) ... ... Balaghat, C. P.
Beeson, C. F. ... ... Rawalpindi.
Beg, Mirza Nazir ... ... Nander, Hyderabad (Deccan).
Begbie, Lt.-Col. A. S. ... ... *Europe.*
Bell, E. N. (I.C.S.) ... ... Allanmyo.
Bell, H. F. E. (I.C.S.) ... ... Jubbulpore, C. P.
Bell, Dr. L. H. I. ... ... Hubli, S. M. R.
Bell, R. D. (I.C.S.) ... ... *Europe.*
Bell, T. R. (I.F.S.) ... ... France.
Bellairs, R. G. ... ... Kumaon, U. P.
Bennett, H. C. (I.F.S.) ... ... Chatrapur.
Benson, Miss A. M. (M.D.) ... ... Bombay.
Benson, J. J. B. (C.E.) ... ... Ahmednagar.
Bentley, Dr. Charles (M.B.) ... ... Darjeeling.
Berhampur, Krishnath College, The Principal ... Berhampur.
Bernard, Col. H. C. ... ... Nasirabad.
Berne, Capt. J. G. (R.A.M.C.)... ... ... *Europe.*
Bernhardt, K. ... ... *Europe.*
Berthon, Major H. W. ... ... Bombay.
Best, The Hon'ble James W. ... ... Bilaspur, C. P.
Betham, Lt.-Col. R. M. ... ... Bangalore.
Bettoni, G. ... ... Bombay.
Betts, Capt. A. J. V. (I.M.S.) ... ... Bombay.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Betts, C. R. S. ... ... Bokakhat.
Beynon, F. C. ... ... Kasauli.
Bharda, J. D. ... ... Bombay.
Bhatavadekar, Sir Bhalchandra Krishna, Kt. ... Bombay.
Bhatia, G. R. ... ... Pilibhit, U. P.
Bhownagar, H. H. the Maharaja Sir Bhaosingji Takht Singji of (G.C.S.I.) (*Life Member*) ... Bhownagar.
Bhurie Singh, H.H. Sir (K.S.C.I., C.I.E.) (*Life Member*) Chamba.
Biggie, H. W. ... ... Bahraich.
Biggs, A. A. ... ... Goa.
Bignell, G. N. ... ... Chaman.
Bijawar, H. H. the Maharaja Sawai Sawant Singh Bahadur... ... ... Bijawar, C. I.
Bikanir, H. H. Col. the Maharaja Sir Gunga Singh Bahadur of (G.C.S.I., G.C.I.E.) (*Life Member*) Bikanir.
Binning, D. B. ... ... Bombay.
Binny, A. C. M. ... ... Aden.
Birch, C. V. ... ... Bombay.
Bird, Lt.-Col. R. (I.M.S.) ... ... Calcutta.
Birkett, Mrs. T. W. ... ... *Europe.*
Bishop, Fred. ... ... Rangoon.
Bishop, L. ... ... Europe.
Bishop, Dr. T. H. ... ... Paksey, Eastern Bengal.
Bisset, Capt. E. (I.M.S.) ... ... Bannu.
Blackwood, N. O'Reilly ... ... Secunderabad.
Blake, A. A. ... ... Chapra, Saran.
Blanford, Capt. C. E. (R.A.) ... ... Kohat.
Blanford, H. R. (I.F.S.) ... ... Rangoon.
Blathwayt, C. H. (I.C.S.) ... ... Mirpurkhas.
Blatter, Revd. E. (S.J.) ... ... *Europe.*
Bloech, E. O. ... ... Rangoon.
Blunt, H. R. ... ... Srinagar.
Boag, G. T. ... ... Palamcottah.
Boalth, V. H. ... ... *Europe.*
Boalth, Capt. W. H. (I.M.S.) ... ... Baroda.
Bogle, Major J. S. ... ... Mardan.
Boles, D. C. ... ... Sialkot.
Bolitho, E. W. (R.F.A.) ... ... Ferozepore.
Bolster, R. C. (I.C.S.) ... ... Lahore.
Bomanji, K. R. (I.C.S.) ... ... Dhulia.
Bombay Government, The Chief Secretary, Separate Department ... ... Bombay.
Bombay Veterinary College. The Principal ... Bombay.
Bomford, Capt. T. L. (I.M.S.)... ... ... Bombay.
Bostock, T. M. ... ... Mardan.
Botham, A. W. (I.C.S.) ... ... Shillong.
Boughey, G. M. (I.C.S.) ... ... Simla.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Bourchier, E. F. G.	... Peshawar.
Bourke, D. R. S.	... Godhra.
Bowden, H. F.	... Mandalay.
Bowen, J. C. G.	... Bombay.
Boxwell, Capt. A.	... Bangalore.
Boxwell, F.	... London.
Boyd, C. C. (I.C.S.)...	.. Ratnagiri.
Boyd, Capt. J. E. M. (R.A.M.C.) ...	... Ferozepore.
Boyle, D. H. M.	... *Europe.*
Bracken, Capt. G. P. A. (R.A.M.C.) ...	... Secunderabad.
Bradley, J. W.	... Katha.
Bradshaw, J. P.	... Bombay.
Brandon, J. A.	Bombay.
Branford, R.	... Punjab.
Brassey, Capt. L. P.	... Mandalay.
Bridgeman, Lt. The Hon. H. G. O. ...	... Rawalpindi.
Bridgeman, Lt. Comdr. The Hon. R. O. B.	... *Europe.*
Bright, Geo. E. (C.E.)	... Katol, C. P.
Briscoe, P. C.	... *Europe.*
Brodie, N. S. (I.C.S.)	... Chitoor.
Brook-Fox, E. (C.E.)	.. Junagadh.
Brooke, A. F.	... Ambala.
Brooke, A. S.	... Aden.
Brooke, R. H.	... Bombay.
Broughton, Capt. T. D. (R.E.)... ...	... *Europe.*
Brown, Major H. R. (I.M.S.)	... Belgaum.
Brown, Prof. R. S. C. (B.S.C.) ...	... Poona.
Browne, A. A.	... Bombay.
Browne, D. R. H.	... Shikarpur.
Browning, G. E. (M.I.C.E.)	... Trichoor.
Brownlow, C. C.	... *Europe.*
Brymer, W. H.	... Panniar Bridge, P. O., S. India.
Budd, Col. N. A. H.	... Bolarum, Deccan.
Bulkley, E. B. M.	.. *Europe.*
Bulkley, H. G.	... Thana.
Bulkley, W. W.	.. Bulsar.
Bull, E. H.	... Hoogrijan, P. O.
Burd, Capt. E. (I. A.)	... Rangoon.
Burd, P....	... Itakhola, P.O. Sylhet
Burder, H. C. (*Life Member*)... ...	... *Europe.*
Burkill, I. H. (M.A.)	... Singapore.
Burn, J. G. (I.C.S.)	... Madura.
Burne, Capt. L. E. L.	... *Europe.*
Burnett, Prof. K.	... Hyderabad, Deccan.
Burnett. R. H.	... Sholapur.
Burns, C. L.	... Bombay.
Burns, W.	... Poona.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Burt, E. H. ... ... Bombay.
Burton, Lt.-Col. R. G. ... ... *Europe.*
Burton, Major Richard W. ... ... Meerut.
Bury, Charles H. ... ... *Europe.*
Busch, H. F. ... ... Bombay.
Butcher, A. ... ... Behali P. O., Assam.
Bute, The Most Hon'ble Marquis of (*Life Member.*) *Europe.*
Butler, A. L. ... ... *Europe.*
Butler, Capt. H. M. ... ... Baroda.
Butler, S. G. ... ... Assam.
Byculla Club, The Hon. Secretary ... ... Bombay.
Byrne, Capt. E. G. J. ... ... Bombay.

Cabell, W. H. L. (I.C.S.) ... ... Rangoon, Burma.
Caccia, A. M. (I.F.S.) (*Life Member*) ... ... *Europe.*
Cadell, P. R. (I.C.S.) ... ... Bombay.
Calcutta, Hon. Secretary, Zoological Gardens ... Calcutta.
Calder, H. ... ... Rangoon.
Calder, N. ... ... Lucknow.
Caldwel, John ... ... Calcutta.
Caleb, Dr. C. C. ... ... Lahore.
Cama, Dr. Maneckjee D. (M.D.) (*Life Member*) ... Bombay.
Cambridge University Museum of Zoology, the Superintendent ... ... *Europe.*
Cameron, I. M. ... ... Bengal.
Cameron, Thos. H. ... . Quilon, Travancore.
Cameron, W. L. (C.E., C.S.I.)... ... ... *Europe.*
Campbell, Capt. D. (*Life Member*) ... ... *Europe.*
Campbell, A. S. ... ... *Europe.*
Campbell, R. C. C. ... . Katha, U. Burma.
Campbell, R. G. ... ... *Europe.*
Campbell, W. E. M. (I.C.S.) ... ... Lucknow.
Candy, H. E. ... ... Toungoo, Burma.
Canning, Fred. (I.F.S.) ... ... Almora, U. P.
Capper, Major A. Stewart ... ... Shiraz, Persian Gulf.
Capper, Brigadier-Genl. W. ... ... *Europe.*
Cardozo, C. H. ... ... Cuddalore.
Carey, Capt. W. R. ... ... *Europe.*
Carleton, M. B. (M.D.) ... ... Punjab.
Carmichael, The Hon'ble Mr. G. (I.C.S.) ... Bombay.
Carmichael, H. E. The Hon'ble Lord (G.C.I.E., K.C.M.G.) ... ... Calcutta.
Carr, R. C. C. (I.C.S.) ... ... Delhi.
Carr, T. (I.F.S.) ... ... Naini Tal.
Carruthers, N. L. M. ... ... Jhansi.
Carter, B. S. ... ... Malacca.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Carter, C. E. (R.N.) ... ... Atlantic Fleet.
Carter, Capt. J. F. C. ... ... Bassein, L. Burma.
Carter, Major J. R.... ... ... Kathiawar.
Carson, A. de C. ... ... Jaffna, Ceylon.
Carson, G. M. ... ... Papua, New Guinea.
Casling, Dr. P. V. (I.S.M.D.) ... ... Sialkote.
Cassamali Jairajbhoy Peerbhoy (*Life Member*) ... Bombay.
Cater, A. N. L. (I.C.S.) ... ... Fort Sandeman.
Cattell, J. G. ... ... Karachi.
Cavanagh, B. F. ... ... Bombay.
Cave, W. A. ... ... Colombo.
Central Research Institute, The Director ... Kasauli, Punjab.
Chalk, G. F. ... ... Bombay.
Chambers, D. W.... ... ... Calcutta.
Chamen, C. H. K. ... ... Hyderabad, Deccan.
Chamier, F. C. (I.C.S.) ... . Mirzapur.
Channer, Capt. B. G. ... ... Kohat.
Channer, Capt. Kendall ... ... *Europe.*
Chanter, E. D. ... ... *Europe.*
Chapman, W. H. ... ... Karachi.
Chatfield, H. S. (B.A., Bar.-at-Law) ... ... Bombay.
Chaudhuri, B. L. ... ... Calcutta.
Chesney, H. G. ... ... Toungoo, Burma.
Chibber, H. M. (M.A.) ... ... Ahmedabad.
Chico, J. R. (C.E.) ... ... Baroda.
Childers, H. F. E. ... ... Burma.
Chitty, The Hon'ble Mr. Justice C. W. ... Calcutta.
Christie, C. ... ... *Europe.*
Christopher, S. ... ... Rangoon.
Clark, J. (I.C.S.) ... ... *Europe.*
Clarke, B. L. 23rd Cavalry F. F. ... ... Quetta.
Clarke, L. O. (I.C.S.) (*Life Member*) ... ... Nowgong.
Clarke, Robt. L. H. (I.C.S.) ... . Orai, Jalaun Dist.
Clayton, Major E. F. ... ... *Europe.*
Clayton, F. ... ... Nagpur.
Clifford, Capt. R. ... ... Benares.
Clift, F. A. ... ... Burma.
Clive, Herbert ... ... Myitkyina, Burma.
Clouston, D. ... ... Nagpur.
Clutterbuck, P. H. (I.F.S., F.Z.S.) ... ... Naini Tal.
Coates, C. F. ... ... Lakon.
Coates, Capt. V. ... ... *Europe.*
Coats, J. R. (B.S.C., A.M.I.C.E.) ... ... Madras.
Cochin, Private Secretary to H. H. the Raja Tripunittura ... ... Ernakulam.
Coen, W. W. ... ... Hubli, S. M. Ry.
Coghill, Major N. S. (I.A.) ... ... *Europe.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Cogill, Dr. H. (M.R.C.S., L.R.C.P.) ...	... *Europe.*
Colam, H. N.	... Pardi, B. B. & C. I. Ry.
Coldstream, J. (I.C.S.)	... *Kuḷu*, Kangra Dist.
Cole, S. H.	... Bangkok.
Collier, J. V. (I.F.S.)	... Ramnagar.
Collings, F. W. (I.F.S.)	... Shwegyin.
Colomb, Lt.-Col. R. P.	... *Europe.*
Colombo Museum, The Librarian ...	... Colombo.
Colston, Major H. K.	... Hyderabad.
Coltart, Dr. H. N. (*Life Member*) ...	... Darbhanga, T.S.Ry.
Comber, Edward (F.Z.S.)	... Bombay.
Comber, E. P.	... Bombay.
Condon, E C. H. (M.A.I., A.M.I.C.E.) ...	... Abu Road, Rajputana.
Congreve, C. R. T.	... Coimbatore.
Coningham, Capt. M. E.	... Bombay.
Conley, Andrew	... America.
Connor, Capt. F. P. (F.R.C.S., I.M.S.) ...	... *Europe.*
Conservator of Forests, Berar Circle ...	... Amraoti.
Conservator of Forests, N. C. Division...	... Jubbulpore, C. P.
Coode, J. M. (*Life Member*)	... *Europe.*
Cook, Chas.	... *Europe.*
Cook, Geo.	... Ceylon.
Cook, J. Pemberton	... Burma.
Cooke, E. Bernard...	... Manmad.
Cooper, H. L.	... Dibrugarh.
Cooper, Lt.-Col. P. T. (R.A.)	... Rangoon.
Cooper, R. W.	... Karachi.
Cooper, T.	... Bandikui.
Coote, M. C.	... Jhansi.
Copeland, T. B. (I.C.S.)	... Bannu.
Copleston, W. E. (I.F.S.)	... Belgaum.
Corbett, Capt. W. F.	... *Europe.*
Cordue, Lt.-Col. W. G. R. (R.E.) ...	... Calcutta.
Cosens, F. R.	... Colombo, Ceylon.
Cosens, Lieut. G. P.	... Africa.
Cotton, C. W. E. (I.C.S.)	... Madras.
Cotton, W. B. (I.C.S.)	... Gonda, N. P.
Courthope, E. A.	... *Europe.*
Coutts, W. S.	... *Europe.*
Coventry, B. O. (I.F.S.)	... Lahore.
Covernton, Professor A. L.	... Bombay.
Covernton, S. H. (I.C.S.)	... Larkhana.
Cowie, Rev. A. G. G. (*Life Member*) ...	... Rawal Pindi.
Cowie, W. P. (I.C.S.)	... *Europe.*
Cox, C. E. C. (F.Z.S.)	... Hoshangabad, C.P.
Cox, Col. Sir P. Z. (F.Z.S., F.R.G.S., C.I.E.)	... Bushire.
Cox, S. (I.F.S.)	... Ootacamund.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Craddock, W. H. (I.F.S.) ... ... Rangoon.
Craw, H. H. ... ... Rangoon.
Crawford, F. L. ... ... Drug, C. P.
Crawford, Leslie ... ... Bombay.
Crawford, W. M. (I.C.S.) ... ... Sambalpore.
Crerar, J. (I.C.S.) ... ... Bombay.
Croly, A. E. J. ... ... *Europe.*
Cross, H. E. ... ... Muktesar.
Cross, R. G. ... ... Daloo P.O., Cachar.
Crosthwaite, B. M. ... ... Twatoung.
Cruickshank, A. H. P. ... ... Lahore Cantt.
Cruickshank, W. D. ... ... Dholpur.
Crum, W. E. ... ... Calcutta.
Cubitt, G. E. S. (I.F.S.) ... ... *Europe.*
Cuffe, Mrs. C. T. W. ... ... Rangoon.
Cuffe, T. W. ... ... *Europe.*
Culbertson, T. M. S. (A.M.I.C.E.) ... ... Bombay.
Cumming, J. W. N. ... ... Quetta.
Cummings, Col. W. H. (R.G.A.) ... ... *Europe.*
Cunningham, Capt. J. ... ... Bombay.
Currie, A. J. ... ... Lahore.
Currie, M. M. L. (I.C.S.) ... ... Ferozepore.
Currimbhoy Ebrahim, Sir, Bart. ... ... Bombay.
Currey, E. S. ... ... *Europe.*
Currey, Capt. V. F. ... ... *Europe.*
Curror, John ... ... S. Sylhet.
Cursetji, Khan Bahadur C. M. (*Life Member*) ... Bombay.
Cutch, H. H. Sir Shri Kengurji Sawai Bahadoor, the Rao Saheb of (G.C.I.E.) (*Life Member*) ... Bhuj, Cutch.

D'Abreu, E. A. ... ... Nagpur.
D'Albedyhll, C. C. ... ... *Europe.*
Dalgliesh, G. ... ... *Europe.*
Dallaporta, J. N. ... ... Bombay.
Dalrymple-Hay, Mrs. L. ... ... Trichinopoly.
Daly, The Hon'ble Col. Sir Hugh (K.C.I.E., C.S.I.) Mysore.
Daly College, The Librarian ... ... Indore, C. I.
Dames, Felix L. ... ... Germany.
Daniell, Col. A. C. (R.A.) ... ... *Europe.*
Danson, J. W. W. ... ... *Europe.*
Darjeeling, The Vice-President, Natural History Museum ... ... Darjeeling.
Dastur, J. F. ... ... Pusa, Bengal.
Datia, H. H. the Maharaja Lokendra Govind Singh, Bahadur ... ... Datia, C. I.
Daukes, Capt C. T. ... ... Kashmir.
Davidson, J. ... ... *Europe.*
Davidson, Major J. (I.M.S., D.S.O.) (*Life Member*) ... Dehra Dun.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Davidson-Houston, Major C. E. D. ...	... Quetta.
Davidson, Norman	... Thazi, Burma.
Davidson, H. M. M.	... Behali P. O. Assam
Davies, H. J. (F.G.S.)	... Burma.
Davison, A.	... Raipur.
Dawkins, C. G. E. (I.F.S.)	... Pyinmana, Burma.
Dawson, W. G.	... *Europe.*
Dawson, W. H. (I.C.S.) (*Life Member*) ...	... *Europe.*
Deakin, Mrs. M. E.	... Bombay.
Deane, Dr. A. H.	... Bombay.
Deane, H. H. (C.E.)	... Bombay.
Deane, N. B.	... Rangoon.
De Carteret, St. G.	... Etah, U. P.
DeCruz, A. M.	... Bombay.
DeRho-Philipe, G. W. V. F.E.S. ...	... Bombay.
DeSouza, A. B.	... Karwar.
Delmé-Radcliffe, Capt. A.	... Poona.
Delmé-Radcliffe, Lt.-Col. H. ...	... Quetta.
Delany, M. F.	... Bombay.
Dempster, Lieut. G. H.	... Rawalpindi.
Denso, W.	... Bombay.
Deputy Director of Agriculture, Burma	... Mandalay.
Devas, A. E.	... *Europe.*
Dewar, D. (I.C.S.)	... Pilibhit U. P.
Dewar, F. (I.C.S.)	... Balaghat, C. P.
Dewes, Lt.-Col. F. J. (I.M.S.)	... Myingyan.
Dhar, H. H. The Raja of (K.C.S.I.) (*Life Member*)	... Dhar, C. I.
Dharamdas Tribhuvandas Varjivandas, Sir	... Bombay.
Dhunjibhoy Bomanji (*Life Member*) ...	... Bombay.
Director of Agriculture, Bombay ...	... Poona.
Director of Agriculture, F. M. S. ...	... Kuala Lumpur.
Director of Land Records & Agriculture, E. B. & Assam	... Shillong.
Dixey, Revd. Mr. Duncan (C.M.S.) ...	... Sibi, Baluchistan.
Dixit, D. L. (B.A.)	... Poona.
Dobbs, H. R. C. (I.C.S., C.I.E.) ...	... Quetta.
Dobbs, W. E. J. (I.C.S.)	... *Europe.*
Dodgson, J. (I.F.S.)	... Dhulia.
Dodgson, R. C.	... Sialkote.
Dodsworth, P. T. L. (F.Z.S. F.S.S., M.B.O.U.)	... Simla.
Donaghey, J. O. B....	... Bangalore.
Donald, C. D.	... Rangoon.
Donald, C. H.	... Simla.
Donald, J. (I.F.S.)	... Dehra Dun.
Donaldson, Lionel	... Dharamsala Punjab.
Donovan, Lt.-Col. C. (I.M.S.)... ...	... Madras.
Dow H. (I.C.S.)	... Schwan Sind.
Dowlay, F. M.	... Bezwada.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Downing, A. K. Weld ... ... Coonoor, Nilgiris.
Doyle, James ... ... Balâghat, C. P.
Dracott, C. H. ... ... Gangtok
Drake-Brockman, Major D. H. ... ... Lansdowne, Garhwal, U. P.
Drake-Brockman, D. L. (I.C.S.) ... ... Jhansi, U. P.
Drake-Brockman, E. G. (I.C.S.) .. ... Bhagalpur.
Drake-Brockman, Lt.-Col. H. E. (I.M.S., F.Z.S.) ... Bombay. (*Life Member*)
Drake-Brockman, Maj. V. G. (I.M.S.) ... ... Dera Ismail Khan.
Dreckmann, Rev. F. (S.J.) ... ... Bombay.
Drummond, J. R. (B.A., F.L.S.) ... ... Europe.
DuBoulay, The Hon'ble Sir J. H. (I.C.S., K.C.I.E.) ... Delhi.
Dubash, K. D. ... ... Bombay.
Duff, A. C. (I.C.S.) ... ... Mercara, Coorg.
Duke A. H. ... ... Siam.
Duggan, E. M. ... ... Karachi.
Dumayne, Sir F. G. ... ... Calcutta.
Dunbar-Brander, A. A. (I.F.S.) ... ... Nagpur.
Dunlop, Hon'ble Mr. R. W. L. (C.I.E.) ... ... Bombay.
Dunn, C. W. (I.C.S.) ... ... Rangoon.
Dunsterville, Col. K. S. (R.A.) ... ... *Europe.*
Dunsterville, Lt.-Col. L. C. ... ... Srinagar.
Durant, J. L. ... ... Hasimara.
Durie, G. A. ... ... Rangoon, Burma.
Durie, T. E. (R.F.A.) ... ... Cawnpore.
Duxbury, Capt. C. D. (*Life Member*) ... ... Mhow.
Dwane, E. H. ... ... Secunderabad.
Dwane, F. C. ... ... Deccan.
Dwane, H. M. ... ... *Europe.*
Dwane, Major J. W. ... ... *Europe.*
Dyer, Lt.-Col. R. E. ... ... Multan.
Dyson, Lieut.-Col. T. E. (I.M.S.) ... ... Poona.

Eccles, P. (I.C.S.) ... ... Bombay.
Economic Botanist to Government, U. P. ... Cawnpore.
Ede, F. J. (A.M.I.C.E.) ... ... Silchar, Cachar.
Edwards, W. N. ... ... Majuligarh, Assam.
Egerton, B. (C.I.E.) ... ... Hyderabad, Deccan.
Elgee, Major J. W. L. ... . Aden.
Elliot, Capt. C. H. ... ... *Europe.*
Elliott, A. (C.I.E.) ... ... *Europe.*
Elliott-Lockart, Major P. C. ... ... Mardan.
Elliott, R. E. A. (I.C.S.) ... ... Bombay.
Elliott, Lt.-Col. R. H. (I.M.S.) ... ... Madras.
Ellis, E. V. (I.F.S.) ... ... Tharrawaddy.
Ellis, R. H. (I.C.S.) ... ... Mercara, Coorg.
Ellis, S. F. ... ... *Europe.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Elwes, G. F. W.	... Siam.
Elwes, H. J. (F.R.S.)	... *Europe.*
Emanuel, A. E. L. (I.C.S.)	... Larkhana.
Enthoven, The Hon'ble Mr. R. E. (I.C.S., C.I.E.)	... Delhi.
Evans, Evan	... Dibrugarh, Assam.
Evans, Geoffrey (B.A.)	... Hoshangabad, C.P.
Evans, Lt.-Col. G. H. (I.C.V.D., F.L.S., C.I.E.)	... Rangoon.
Evans, Major G. P.	... *Europe.*
Evans, T. M.	... Bombay.
Evans, Lt. T. W. D.	... Rawalpindi.
Evans, Capt. W. H. (R.E.)	... Simla.
Evans, Capt. W. K.	... Jullunder
Everard, L. C. E.	... Mongnai, S. Shan States.
Evershed, John	... Kodaikanal.
Fagan, Capt. B.	... Imphal, Manipur.
Fagan, H. R.	... *Europe.*
Fairbank, Rev. H.	... Ahmednagar.
Falkiner, Dr. J. M.	... *Europe.*
Farmer, E. J. (I.C.S.)	... Lashio.
Farr, E. T. C.	... Ceylon.
Farrel, R. C. (I.F.S.)	... Aurangabad.
Farrington, Sir H. A., Bart. (I.F.S.) ...	... Kurseong.
Fatehsingrao of Akalkote, H. H. Raja ...	... Kirkee.
Fawcett, E. B.	... Port Blair.
Fayrer, Major F. D. S. (I.M.S.) ...	... Bombay.
Fendall, C. E.	... Bussahir State, Simla District.
Fenton, Col. L. L.	... *Europe*
Fenton, Capt. L. S.	... Deesa.
Ferrar, Capt. M. L. (I.A.)	... Kulu.
Ferry, E.	... Benares.
Field, Frank	... Hardoi U. P.
Field, W. P.	... Jalpaiguri.
Filson, J. T. W.	... *Europe.*
Finlay, C. Kirkman	... Rangoon.
Firth, L. B.	... Calicut.
Fischer, C. E. C. (I.F.S.)	... Coimbatore.
Fisher, W. D. (I.F.S.)	... Bandra.
Fitz-Gerald, H. G.	... Rawalpindi.
Fitz-Gerald, Capt. O. A. G.	... Quetta.
Fitz-Gibbon, Lt. F. (R.A.)	... Jubbulpore.
Fitz-Gibbon, P. J. C.E.	... Poona.
Fleming, Major A. M. (I.M.S.) ...	... Raipur.
Fletcher, T. Bainbrigge (F.E.S.) ...	... Coimbatore.
Florence, James	... Cawnpore.
Flower, Capt. S. S.	... *Egypt.*
Flyfishers' Club, The Secretary ...	... *Europe.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Flynn, A. A.	... Karachi.
Forbes, Alister	... Bombay.
Forbes, Col. James	... Bombay.
Forbes-Sempill, The Hon'ble R. A. ...	... *Europe.*
Forster, T. W. (B.F.S.)	... Tharrawaddy.
Forsyth, Dr. W.	... *Europe.*
Foster, R. Guy	... Sallebile P. O., Kadur District.
Foster, Capt. R. T.	... *Europe.*
Foulkes, George F. F. (I.F.S.) ...	... Manantoddy, Malabar.
Foulkes, R.	... Madura.
Foulkes, Major T. H. (I.M.S.) (*Life Member*)	... Madras.
Fountaine, Miss M. E. (F.E.S.) ...	... *Europe.*
Fowle, F. C.	... Bengal.
Fowler, H.	... *New York, U.S.A.*
Fox, J. H. Manning	... Barrackpore.
Francis, R. F.	... Jullundur.
Fraser, D.	... Bombay.
Fraser, D. de M. S.	... Shiraz, Persian Gulf.
Fraser, Capt. F. C. (I.M.S., M.D., F.L.E.S.)	... *Europe.*
Fraser, Prof. J. N.	... Bombay.
Fraser, J. S.	... Madras.
Fraser, The Hon'ble Mr. S. M. (I.C.S., C.I.E.)	... Bombay.
Fraser, S. G. G.	... Bangalore.
Fraser, W. S.	... Ajmer, Rajputana.
Frederick, Capt. E. B.	... *Europe.*
Frere, Capt. A. G.	... Madras.
Friedlander, F. L.	... Insein.
Friedlander and Sohn, Messrs. R. ...	... *Europe.*
Frizelle, Major J.	... *Europe.*
Fry, John T.	... Bombay.
Fulton, Major H. T. (D.S.O.) (*Life Member*)	... Dehra Dun.
Fyson, Prof. P. F.	... Madras.
Gairdner, K. G.	... Bangkok.
Gale, A. C.	... Dharwar.
Gale, Capt. B. (I.M.S.)	... Peshawar.
Gale, Major E. S.	... Maymyo.
Gales, R. R.	... Calcutta.
Gallie, H. H.	... Moulmein.
Gammie, Prof. G. A. (*Life Member*) ...	... Kirkee.
Garbett, C. C. (I.C.S.)	... Lahore.
Gardyne, Major A. D. G.	... Cairo.
Garrett, H. B. G. (I.F.S.)	... Bangkok.
Garrett, R. S.	... Mhow.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Gaye, W. C.	... Secunderabad.
Gatherer, Capt. R. G. T.	... Bhamo, Burma.
Gauhati Club, The Librarian... ...	... Ranhati.
Gebbie, F. St. J.	... Karachi.
George, C. P.	... Secunderabad.
Gerhardt, Paul	... *Europe.*
Gervers, Capt. F. R. S.	... Bombay.
Gharpurey, Capt. K. G. (I.M.S.) ...	... Bombay.
Ghosal, J. (I.C.S.)	... Panch Mahals.
Giberne, H. D.	... Mandalay.
Gibson, A. J. (I. F. S.)	... Kotgarh, Simla Dist.
Gibson, E. C. (I.C.S.)	... Akola.
Gibson, R. E. (I.C.S.)	... Bombay.
Gibson, W. R. (F.R.C.S., L.R.C.P.) ...	... *Europe.*
Gilbert, C. C.	... Ceylon.
Gilbert, C. E. L. (I.F.S.)	... Nasik.
Gilbert, R. N.	... Dongri P. O
Gilbert-Cooper, W. J. (I.F.S.)... ...	... Kado, Moulmein
Giles, A. R.	... *Europe.*
Giles, G. W.	... Trichinopoly.
Gilchrist, G. W.	... Bombay.
Gill, Capt. C. A. (I.M.S.)	... Rawalpindi.
Gill, C. G.	... Amritsar.
Gill, H.	... Cachar.
Gillespie, Major R. S. (R.E.)	... Secunderabad.
Gillett, Capt. E. S. (A.R.D.)	... Saharanpur.
Gillies, Capt. F. G....	... Quetta.
Gillum, S. J.	... Calcutta.
Gimlette, Lt.-Col. G. H. D. (C.I.E., I.M.S.)	... *Europe.*
Gimlette, Dr. J. D.	... Kelantan, F. M. S.
Gimson, C. (I.C.S.)	... Gauhati.
Girard, George	... Calcutta.
Girvin, Lt.-Col. J. (R.A.M.C.)... ...	... Ahmednagar.
Gladstone, H. S. (F.Z.S., F.R.S.E.) ...	... *Europe.*
Glascock, L. C. (M.V.O.)	... Lahore.
Glasson, J. W. (I.C.S.)	... Godaveri, Madras.
Gleadow, F. (F.R.M.S.)	... *Europe.*
Gloster, Capt. J. H. (I.M.S.)	... Bombay.
Godber, Rev. John	... Calcutta.
Godfrey, E. J. (B.SC)	... Bangkok.
Godson, Capt. C. A. (I.M.S.)	... Dacca.
Goldsmith, Dr. B. K.	... Bombay.
Goldsmith, H. A.	... Bolarum, Deccan.
Goll, E. A.	... Bombay.
Gombert, Rev. F. (S.J.)	...-Trichinopoly.
Gonsalves, A. F. (*Life Member*)	... Bandra.
Gordon, D. M.	... Keng Tung, S. Shan States.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Gordon, K. L. ... ... Ceylon.
Gordon, R. G. (I.C.S.) ... ... *Europe.*
Gordon-Ralph, J. B. ... . *Europe.*
Gore, F. W. ... ... Hoogrijhan, Assam.
Gore, Dr. S. N., L.M.S. ... ... Agra.
Goss, E. H. A. ... ... Rangoon.
Gough, Lt.-Col. C. H. ... ... *Europe.*
Gough, Major H. (I.A.) ... ... Quetta.
Gould, B. J. (I.C.S.).. ... ... Gyantse.
Gourju, P. E. ... ... Berhampur.
Gover, A. A. ... ... Bangalore.
Grafton-Wignall, J. D. ... ... *Europe.*
Graham, A. K. ... ... Bombay.
Graham, C. T. ... ... Rangoon.
Graham, Capt. G. H. I. ... ... Ajmer.
Graham, J. A. ... ... Mercara, Coorg.
Graham, L. (I.C.S.) ... ... Bombay.
Graham, R. J. D. (M.A.) ... ... Nagpur, C. P.
Graham Roe, E. W. ... ... *Europe.*
Graham, W. L. ... ... Bombay.
Grant, F. A. ... ... Bhamo, Burma.
Gravely, F. H. ... ... Calcutta.
Gray, Chas. ... ... Coonoor.
Gray, P. B. ... ... *Europe.*
Greaves, H. R. ... ... Bombay.
Greaves, S. E. ... ... *Europe.*
Green, E. Ernest (F.E.S.) ... ... *Europe.*
Green, James ... ... *Europe.*
Green, Lt.-Col. J. S. (R.A.M.C.) ... ... Bangalore.
Greener, W. J. ... ... Charanpur.
Greer, Major F. A.... ... ... Quetta.
Greer, R. F. (I.C.S.) ... ... Rangoon.
Greer, W. (I.C.S.) ... ... *Europe.*
Gregory, R. V. ... ... Purna, Deccan.
Gregson, Capt. C. D. ... ... Bangalore.
Gregson, E. G. (C.I.E.) ... ... Peshawar.
Gregson, T. S. ... ... Bombay.
Greig, Major W. B. ... ... Nowshera.
Grey, W. A. P. ... ... Burma.
Gribbon, M. C. ... ... Quetta.
Grigson, P. St. J. B. ... ... Rangoon.
Grieve, F. C. L. (R.H.A.) ... ... Mhow, C. I.
Grönvold, H. ... ... *Europe.*
Gross, Carl ... ... Rangoon.
Grubbe, Major E. A. ... ... *Europe.*
Gupta, B. Sen ... ... Fakiragram, Dhubri
Gupta, Basat Lal (B. SC.) ... ... Lucknow.
Gurdon, Lt.-Col. B. E. M. ... ... Dhar, C. I.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Gut, J.	... Andheri.
Gwyer, C. (I.F.S.)	... Thayetmyo.
Habibuddin, S. (N.C.S.) (*Life Member*) ...	... Hyderabad, Deccan.
Hacker, K.	... *Europe.*
Haeberle, Curt. (I.F.S.)	... *Europe.*
Haffenden, Ed. D. H.	... Rangoon.
Haig, Major N. W.	... Muttra.
Haigh, P. B. (I.C.S.)	... *Europe.*
Hale, Lt.-Col. C. H. (R.A.M.C.) ...	... Kamptee, C. P.
Haldane, C. H.	... Mandalay.
Hall, W. D.	... Bombay.
Hallaner, Martin	... Bombay.
Hamburg Natural History Museum ...	... Hamburg.
Hamer, Thruston	... Ceylon.
Hamid, A. Ali	... Hyderabad, Sind.
Hamilton, A. G.	... *Europe.*
Hamilton, J. D. (B.F.S.)	... Sandoway.
Hammond, A. H.	... *Europe.*
Hampson, Sir George F., Bart. (F.L.S., F.E.S.)	... *Europe.*
Hankin, A. C. (C.S.I., C.I.E.)	... Secunderabad.
Hanhart, S.	.. Bombay.
Hankin, Dr. E. H....	... Calcutta.
Hannay, A. L. (I.C.S.)	... Waltair.
Hannyngton, F. (I.C.S.)	... Mercara.
Hannyngton, W. O.	... Shwebo, Burma.
Harcourt, Major J. S. M.	... Dehra Dun.
Hardie, Dr. Geo. W.	... Big Canjeeveram, S. India.
Hardy, G. S. (I.C.S.)	... Bombay.
Harington, Major H. H.	... *Europe.*
Harington, Col. V. (I.M.S.)	... *Europe.*
Harker, O. Allen	... Sholapur.
Harman, S. H.	... Tavoy.
Harold, Major C. F.	... Wadhwan.
Harper, E. W. (F.Z.S.)	... Africa.
Harris, H. R.	... Bombay.
Harris, Capt. O. M. (R.H.A.)	... Trimulgherry.
Harris, W.	... Gauhati.
Harrison, A. J.	... Lakhimpur, Assam.
Harrison, Major C. B. (I.M.S.) ...	... *Europe.*
Harrison, Major C. F.	... Tavoy.
Harrison, C. H. (I.C.S.)	... Nilgiris.
Harrison, R. T. (A.M.I.C.E.) ...	... Nasik.
Harrold, W.	... Abu Road.
Hart, E. H.	... *Europe.*
Hart, G. S. (C.I.E.)	... Nagpur, C. P.
Harter, R. W.	... Bombay.
Hartshorne, J. F. B. (I.C.S.) ...	... Kaira.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Harvey, Capt. W. F. (I.M.S.) ... ... Kasauli.
Haslam, R. E. ... ... Travancore.
Hasted, H. R. G. ... ... Chittoor.
Hasted, W. A. ... ... Tinnewelly.
Hassels-Yates, Capt. G. A. (R.G.A.) ... ... Egypt.
Hatchell, D. G. ... ... *Europe.*
Hate, Prof. Vinayek N. ... ... Bombay.
Haughton, Cap. H. L. ... ... *Europe.*
Hauxwell, T. A. (I.F.S.) ... ... Maymyo.
Hawley, Capt. W. G. B. ... ... Multan.
Hay, E. Alan ... ... *Europe.*
Hay, E. F. A. ... ... Pyinmana.
Hay, Capt. G. W. ... ... *Europe.*
Hayden, H. H. (C.I.E.) ... ... Calcutta.
Hazlewood, Miss M. ... ... Rangoon.
Hearn, E. S. ... ... Meerut.
Headlam, Lt. E. James (R.I.M.) ... ... Bahrein, P. Gulf.
Hearsey, C. H. ... ... Burma.
Hearsey, T. N. (I.F.S.) ... ... Pollikonda.
Heath, H. A ... ... Horawala, Ceylon.
Heath, R. H. (C.E.) ... ... Ahmedabad.
Hector, G. P. (M.A., B.SC.) .. .. Dacca.
Heeckerenz, Baron Von (*Hon. Corres. Member*)... *Europe.*
Hemans, Capt. G. W. ... ... Bolarum, Deccan.
Henderson, Capt. H. D. ... ... Imphal, Manipur.
Henderson, Capt. R. R. ... ... *Europe.*
Henderson, G. S. ... ... Mirpurkhas, Sind.
Henderson, W. L. ... ... Rangoon.
Hepburn, W. ... ... Rangoon.
Herbert, H. P. ... ... Trevandrum.
Herbert, V. A. ... ... Almora.
Heron, F. A. ... ... Punjab.
Heseltine, Capt. G.... ... ... *Europe.*
Heseltine, Capt. J. E. N. ... ... Jubbulpore, C. P.
Hewetson, Major A. W. (R.F.A.) ... ... Dinapore.
Heygate, Col. R. H. G. (D.S.O.) ... ... *Europe.*
Hichens, G. W. ... ... Rangoon.
Hickman, R. St. J. ... ... Cachar.
Hickey, B. S. ... ... Champarun.
Hide, P. (*Life Member*) ... ... Indore.
Higgins, H. A. ... ... Hatikhira Sylhet.
Higgins, J. C. (I.C.S.) ... ... Imphal, Manipur
Higginson, G. R. ... ... Lucknow.
Hignell, S. R. (I.C.S.) ... ... Purulia.
Hiley, A. C. (I.F.S.) ... ... Belgaum.
Hill, Rev. E. E. (M.A.) ... ... Bombay.
Hill, Hon'ble Mr. Claude H. (I.C.S., C.I.E., C.S.I.)... Bombay.
Hill, E. W. ... ... Mandalay.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Hill, Capt. R. D. O. (*Life Member*) ... ... Chitral.
Hingston, R. W. (I.M.S.) ... ... Bombay.
Hitchcock, R. H. ... ... Salem.
Hoare, H. J. (I.C.S.) ... ... *Europe.*
Hobart, R. C. (I.C.S.) ... ... Gorakhpur.
Hobson, L. C. ... ... Dharwar.
Hodgson, Capt. M. R. K. ... ... Jubbulpore.
Hodgson, Hon'ble Mr. H. P.... ... ... *Europe.*
Hojel, Lt.-Col. J. G. (I.M.S.) ... ... Bombay.
Holberton, N. V. (I.F.S.) ... ... Rangoon.
Holden, Major H. N. ... ... Jaipur.
Hole, R. S. (I.F.S.) ... ... Bombay.
Holkar, H. H. the Maharaja Tukuji Rao (*Life Member*) ... ... Indore, C. I.
Holland, Dr. H. T. (C.M.S.) ... ... Quetta.
Holland, L. B. ... ... Lahore, Punjab.
Holme, A. T. (I.C.S.) ... ... Ajmer.
Holme, H. B. (I.C.S.) ... ... Simla.
Holmes, H. R. ... ... Kamptee, C. P.
Hood, A. F. ... ... Mogok, Burma.
Homfray, Jeston ... ... Assam.
Hoosein Belgrami, The Hon'ble Mr. Syed Nawab Imud-ul-Mulk Bahadoor (C.S.I.) ... ... Hyderabad, Deccan.
Hope, A. J. R. ... ... Taunggyi, Burma.
Hopwood, J. C. ... ... Mandalay, Burma.
Hopwood, S. F. (I.F.S.) ... ... Maymyo, U. Burma.
Hosken, A. Fayrer... ... ... Secunderabad.
Hoste, R. D. ... ... Purulia, Bengal.
Hotson, J. E. B. (I.C.S.) ... ... Larkana.
Howell, E. B. ... ... *China.*
Howell, G. C. (I.C.S.) ... ... Lahore.
Howlett, Capt. A. W. (I.M.S.) ... ... Agra.
Howlett, F. M. (M.A., F.E.S.) ... ... Pusa.
Hudson, Lt.-Col. C. T. (I.M.S.) ... ... Dharwar.
Hudson, Major C. ... ... Bangalore.
Hudson, C. W. M. (I.C.S.) ... ... Bombay.
Hudson, Major J. H. ... ... *Europe.*
Hudson, Capt. P. ... ... Rangoon.
Hudson, E. H. (A.M.I.C.E.) ... ... Jalna, Deccan.
Huggins, J. R. ... ... Madras.
Hughes, Capt. F. L. ... ... Waziristan.
Hughes, T. O. ... ... *Europe.*
Hughes, E. A. ... ... Munnar, S. India.
Hulbert, Major J. G. (I.M.S.)... ... ... Muttra
Hulton, W. P. ... ... Gangapur.
Hume, H. R. (D.S.P.) ... ... Dharwar.
Humphrys, Capt. F. H. ... ... Bombay.
Hundley, G. ... ... Mepole.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Hunt, C. B. Holman... ... ... Kuala Lumper.
Hunt, A. R. (I.F.S.)... ... ... Akola, Berar.
Hunt, Capt. A. T. (R.N.) ... ... China Station.
Hunt, Dr. E. H. ... ... Secunderabad.
Hunt, Capt. F. W. ... ... Sialkot.
Hunter, W. H. ... ... Calcutta.
Husbands, H. W. S. (A.M.I.C.E.) ... ... Hingoli, Deccan.
Husbands, Capt. G. S. (I.M.S.) ... ... Lahore.
Husbands, J. E. (I.C.S.) ... ... Bombay.
Hutchins, B. R. ... ... Shwegyin.
Hutchinson, Major F. H. G. (I.M.S.) ... ... Poona.
Hutchinson, Major L. T. R. (I.M.S.) ... ... Bombay.
Hutchison, L. P. ... ... Gonda.
Hutton, C. I. ... ... Ywataung.
Hyam, Judah (G.B.V.C., F.Z.S.) (*Life Member*) ... Pusa, Bengal.
Hyde-Cates, Lt.-Col. G. E. ... ... *Europe.*
Hyderabad, the Librarian, State Library ... Hyderabad, Deccan.

Ichalkaranji, The Hon'ble Meherban Narayen Govind *alias* Babasaheb Ghorpade, Chief of (*Life Member*) ... ... Kolhapur.
Idar, Maharaj Kunwar Major Dowlatsing, A.-D.-C. Mahi Kanta.
Inglis, C. C. ... ... Kopargaon.
Inglis, Chas. M. (*Life Member*) ... ... Durbhanga.
Inglis, H. A. ... ... Anarh Laber ia Serai.
Ingram, Capt. A. C. (I.M.S.) ... ... Madras.
Inman, Capt. H. M. (I.M.S.) ... ... Bombay.
Innes, Charles (B.S.C.) ... ... Rangoon.
Inspector of Schools, Surma Valley & Hill Dists... Cachar, Assam.
Inverarity, J. D. (B.A., LL.B.) (*Life Member*) ... Bombay.
Irvine, Lt.-Col. T. W. (I.M.S.) .... Peshawar.
Irwin, C. J. (I.C.S.) ... ... *Europe.*
Ivens, Capt. H. T. C. ... ... Miranshah.
Ivens, J. H. (P.W.D.) (*Life Member*) ... ... *Europe.*
Iyer, V. Subramania (M.A., F.L.S.) ... ... Coimbatore.

Jackson, Dr. T. S. .. .. Abu Road.
Jackson, H. (I.F.S.) ... ... *Europe.*
Jackson, Lt.-Col. Thos. (I.M.S.) ... ... Ahmedabad.
Jacob, W. R. LeGrand (I.F.S.) ... ... Shillong.
James, Aston ... ... *Europe.*
James, C. H. ... ... Lahore.
James, Lt.-Col. C. H. (I.M.S.) ... ... Patiala, Punjab.
James, Capt. F. H. ... ... Bombay.
James, Mrs. Leslie... ... ... Mandalay.
Jamkhandi, Shrimant Parashram Ramchandra Patwardhan, The Chief of (*Life Member*) ... Kolhapur.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Jamsetji M. Doctor (C.M.Z.S.) ... ... Bombay.
Janjira, H. H. Sir Sidi Ahmed Khan (K.C.I.E.) Nawab of (*Life Member*) ... ... Janjira.
Janson, V. T. ... ... *Europe.*
Jardine, A. J. A. (D.S.P.) ... ... Rangoon.
Jardine, E. R. ... ... Rangoon.
Jardine, M. R. ... ... *Europe.*
Jardine, W. E. (I.C.S., C.I.E.) ... ... Gwalior, C. I.
Jayakar, M. S. (M. A.) ... ... Alibag.
Jeddere-Fisher, H. C. ... ... *Europe.*
Jellett, H. H. ... ... Calcutta.
Jenkins, Lt. N. M. (R.G.A.) ... ... Madras.
Jenkin, R. Trevor ... ... Saugor, C. P.
Jenkins, S. E. F. (I.F.S.) ... ... Rangoon.
Jenkins, J. B. ... ... *Europe.*
Jenkins, H. H. (I.C.S.) ... ... Rupar.
Jennings, Lt.-Col. W. E. (I.M.S.) ... ... Bombay.
Jermyn, Col. T. ... ... *Europe.*
Jesse, William ... ... Meerut.
Johnson, W. E. C. ... ... Sibsagar.
Johnston, E. G. ... ... Mandalay, Burma.
Johnston, Capt. P. D. C. ... ... Hongkong.
Johnston, Capt. R. G. M. (R.H.A.) ... ... Hong Kong.
Johnstone, J. W. D. (C.I.E.) ... ... *Europe.*
Jolly, Capt. G. G. (I.M.S.) ... ... Kasha.
Jolly, E. H. P. (I.C.S.) ... ... Jalgaon.
Joly, P. B. ... ... China.
Jones, A. E. ... ... Lahore.
Jones, C. P. G. ... ... Burma.
Jones, Lt.-Col. F. W. C. (R.A.M.C.) ... ... Quetta.
Jones, Lt.-Col. J. Lloyd (I.M.S.) ... ... Bombay.
Jones, Major M. D. Goring ... ... Nowshera.
Jones, R. T. ... ... Ferozepore.
Jones, Capt. T. W. H. ... ... *Europe.*
Jones, W. Harvey ... ... Calcutta.
Jones, Dr. W. D. ... ... Kyankse, U.Burma.
Jouguet, H. ... ... Dehra Dun.
Julius, V. A. ... ... Colombo.
Jukes, J. E. C. (I.C.S.) ... ... *Europe.*
Kagal, Meherban Piraji Rao Bapu Saheb Ghote, Chief of ... ... Kagal, S. M. C.
Karachi Victoria Museum ... ... Karachi, Sind.
Kashmir, Rajkumar, Hari Singh of ... ... Ajmere.
Kauffman, Oscar ... ... Marburg *A/L.* Germany.
Kealy, E. H. (I.C.S.) ... ... Rajputana.
Keddie, D. L. ... ... Burma.
Keddie, J. F. ... ... Raheng, Siam.
Kelly, B. P. ... ... Port Blair.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Kelly, Capt. C. R. (R.G.A.) ... ... Srinagar.
Kelly, Capt. E. D. F. ... ... *Europe.*
Kelly, Major H. N. ... ... Jubbulpore, C. P.
Kelsall, Major H. J. (R.A.) ... ... *Europe.*
Kemball, Major A. G. ... ... Fort Sandeman.
Kemball, H. L. ... ... Gurgaon, Punjab.
Kemball, H. V. (C.E.) ... ... Bombay.
Kemp, S. W. ... ... Calcutta.
Kennard, M. J. (F.Z.S.) ... ... *Europe.*
Kennedy-Craufurd-Stuart, Capt. C. (F.Z.S., F.R.G.S.). Myitkyina.
Kennedy, Capt. R. S. (I.M.S.)... ... ... Dinapur.
Kennedy, R. ... ... Bombay.
Kennion, Major R. C. (F.Z.S.) ... ... Malakpand.
Kenrick, Major W. H. (I.M.S.) ... ... Khandwa.
Keogh, A. D. ... ... Narayanganj, E. B. and Assam.
Keppel, Capt. T. R. H. ... ... Bombay.
Kerr, Dr. A. F. G.... ... ... Chiengmai, Siam.
Kerr, H. R. ... ... Rangoon, Burma.
Kerr, Nigel ... ... Bombay.
Kettlewell, Capt. H. W. ... ... *Europe.*
Keys, Capt. W. D. A. (I.M.S.) ... ... Rajkote.
Khan, Muncherji Framji (*Life Member*) ... Bombay.
Khareghat, M. P. (I.C.S.) ... ... Bombay.
Kiddle, J. A. C. ... ... Moulmein.
Kidner, W. E. (R.E.) ... ... Bombay.
Kilkelly, Major P. P. (I.M.S.) ... ... *Europe.*
Kilner, Dr. J. N (M.B.) ... ... *Europe.*
King Edward Library, The Hon. Secretary ... Rawalpindi.
King, A. W. ... ... Dacca.
King, R. C. H. Moss (I.C.S.) ... ... Saugor, C. P.
Kingsford, G. N. (C. E.) ... ... Calcutta.
Kingston, A. H. ... ... Bombay.
Kinloch, A. M. ... ... Kollengode.
Kinloch, A. P. ... ... Yercaud.
Kinloch, Victor ... ... Klang, Federated Malay States.
Kirby, Major A. D. ... ... Allahabad.
Kirkness, L. H. ... ... Madras.
Kirtikar, Lt.-Col. K. R. (I.M.S., Retd.)... ... Andheri, Salsette.
Kirwan, Neol G. B. ... ... Chikmagalur.
Knowles, A. B. (I.C.S.) ... ... Amaraoti Camp.
Knowles, E. D. ... ... Manbhoom.
Knapton, Major H. A. F. (I.M.S.) ... ... Poona.
Knyvett, Capt. W. A. ... ... Lahiria-Sarai.
Koechlin, M. C. ... ... Munaar.
Kolhapur, H. H. the Maharaja Sir Shahu Chhatrapati (G.C.S.I., G.C.V.O., G.C.I.E.) (*Life Member*) ... Kolhapur.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Kotah, H. H. the Maharaja Sir Umed Sing, Bahadoor (K.C.S.I., G.C.S.I.) (*Life Member*) ...	... Kotah.
Kunhardt, Capt. J. E. G. (I.M.S.) ...	... Bombay.
Kushal Pal Singh, Raja ...	... Kotla, Agra Dist.
Kynaston, E.	... Yatiyantola, Ceylon.
Lace, E. W.	... Waltair.
Lace, John H. (I.F.S., F.L.S.)	... Maymyo.
Lahore, Curator, Central Museum ...	... Lahore.
Lahore Punjab Veterinary College, The Principal..	Lahore.
Laird-MacGregor, E. G. L. (I.C.S.) ...	... *Europe.*
Lamb, The Hon'ble Sir R. A. (I.C.S., K.C.S.I. C.I.E.)	Bombay.
Lambert, G. B. (I.C.S.) (*Life Member*) ...	... Bijnor, U. P.
Lane, E.	... Koderma P. O.
Lane, H. S.	... Bangalore.
Lae, Capt. W. H.	... Bombay.
Langford, Capt. E. G. (R.F.A.) ...	... Jubbulpore.
Laughton, G. A.	... Kolaba.
Larkana, Madrassatul-Islam, The Principal	... Larkana Sind.
Laurence, Revd. F. (C.M.S.)	... *Europe.*
Laurie, A. S. (P.W.D.)	... Waltair.
Lawrence, T. R.	... Bombay.
Lawton, W.	... Rangoon.
Leach, F. B.	... Rangoon.
Lean, R	... Madras.
Learoyd, G. E. D.	... Rawalpindi.
Lee, Capt. A. J. (I.M.S.)	... Aurangabad.
Lee, Major A. W. H.	... Quetta.
Lee, D. H. (*Life Member*)	... *Europe.*
Lee, Lt.-Col. F.	... *Europe.*
Lees, John	... *Europe.*
LeMesurier, H. P. (C.E.)	... Calcutta.
Lemarchand, J. R.	... Kookila Mook, Assam.
Lee-Wilson, Rev. H. W.	... Panchgani, Satara.
Leeson, G. W.	... Barisal, Bengal.
Leete, F. A. (F.C.H., I.F.S.)	... Tharrawaddy.
Lefroy, H. Maxwell (M.A., F.E.S., F.Z.S.) ...	... *Europe.*
Leftwich, C. G. (I.C.S.)	... Khandwa.
Legard, Chas.	... Allicutty.
Leonard, Capt. W. H.	... Bombay.
Leslie, Major G. A. J. (R.E.)	... *Europe.*
Leslie, M.	... Bombay.
Leslie, Capt. Norman	... Calcutta.
Levett-Yeats, G. A. (I.S.O.)	... *Europe.*
Ley, A. H. (I.C.S.)	... Calcutta.
Leys, W. G.	... Baraich, Oudh.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Librarian, Students' Library, St. Xaviers' College. Bombay.
Light, Major W. A. ... ... Dibrugarh.
Lightfoot, S. St. C. ... ... Taunggyi, Burma.
Lilburn, W. ... ... Lucknow.
Limaye, S. P. ... ... Sirsi, Karwar.
Lindley, E. S. (C.E.) ... ... *Europe.*
Lindsay-Smith, Capt. J. (I. A.) ... ... Multan.
Linnell, Fred. ... ... Rangoon.
List, John N. ... ... Rangoon, Burma.
Lister, R. S. ... ... Ghoom, D.-H. Ry.
Liston, Major W. G. (I.M.S., C.I.E.) ... ... Bombay.
Little, E. ... ... Kirkee.
Little, F. D. ... ... *Europe.*
Lloyd, Major C. R. (A.S.C.) ... ... Bombay.
Lloyd, J. B. ... ... Calcutta.
Lloyd, Capt. R. E. (I.M.S.) ... ... *Europe.*
Lloyd, Capt. R. A. (I.M.S.) ... ... Peshawar.
Lock, Lt.-Col. F. R. E. (I.S.C.) ... ... Hangu, Kohat.
Lodge, G. E. ... ... *Europe.*
Logan, Capt. R. O. ... ... *Europe.*
Logan Home, W. M. ... ... Thal Fort, N.W.F.P.
Lomas, H. A. (I.C.S.) ... ... Cawnpore.
Long, G. R. (I.F.S.) (*Life Member*) ... ... Rangoon.
Long, Major W. C. ... ... Coimbatore.
Longden, C. C. ... ... Trichinopoly.
Lory, F. B. P. (M.A.) ... ... Dharwar.
Lovegrove, W. H. (I.F.S.) ... ... Jummoo.
Lovell, E. H. (R.A.) ... ... Baragali, Abbottabad.
Lowis, Major R. M. ... ... Dera Ghazi Khan.
Lowndes, G. R. ... ... *Europe.*
Lowrie, A. E. (I.F.S.) ... ... Raipur.
Lowsley, C. O. ... ... Hyderabad, Sind.
Lowson, Major C. S. (I.M.S.) ... ... Poona.
Lowther, Lt.-Col. H. ... ... Bolarum, Deccan
Luard, Major C. E. ... ... Delhi.
Lucas, E. N. A. ... ... Bellary.
Lucas, The Hon'ble Mr. W. H. (I.C.S.) ... ... Karachi.
Luck, W. H. ... ... *Europe.*
Lucknow, The Curator, Provincial Museum ... Lucknow.
Lucknow Public Library, The Honorary Librarian. Lucknow.
Ludlow, F. ... ... Karachi.
Luffman, M. A. ... ... Camilla, Tippera.
Luke, J. H. ... ... Narayenganj.
Luke, K. J. ... ... Chatalpara, Bengal.
Lumsden, O. F. (I.C.S.) ... ... Amritsar.
Lund, E. ... ... Balur P.O.
Lunham, Capt. J. L. (I.M.S.) ... ... Bombay.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Lushington, P. M. (I.F.S.)	... Cuddapah.
Lyall, J. H. (I.F.S.)	... Chakrata.
Lyall, Capt. R. A.	... Parachinar.
Lynn, G. R. (C.E.)	... Manora, Karachi.
Macdonald, K. C. (D.S.P.)	... Burma, Tharrawaddy.
MacGregor, J. A....	... Arconam, Madras.
Macintyre, D.	... Dehra Dun.
Mackay, C. J.	... Mymensingh.
Mackenna, J. (I.C.S.)	... Mandalay.
Mackenzie, Colin A.	... Ootacamund.
Mackenzie, Major K. L. W.	... Benares.
Mackenzie, Lt. L. H. L. (I.M.S.) ..	... Bombay.
Mackenzie, J. M.	... Ghazipur.
Mackenzie, M. M.	... Saran, Bihar.
Mackertich, M.	... Asansole.
Mackiie, A. W. W. (I.C.S.)	... Belgaum.
Mackinlay, Chas.	... *Europe.*
Mackinnon, V. A.	... Mussoorie.
Mackrell, G.	... Sylhet.
MacLachlin, R. B.	... Sukkur, Sind.
Mackwood, F. M.	... Colombo.
Macleod, The Hon'ble Mr. Justice N. C.	... Bombay.
MacMichael, N. (I.C.S.)	.. Chatrapur, Ganjam.
MacNair, R. H. (I.C.S.)	... *Europe.*
Macnab, A. M.	... Maymyo.
Macnee, E. A.	... Jubbulpore.
Macnaghten, H. P. W. (B.A.) ...	... Calcutta.
Maconochie, E. (C.S.)	... Dharwar.
Macphail, G.	... *Europe.*
Macpherson, R. E.	... Mirzapur.
Macpherson, Col. T. R. M.	... *Europe.*
Macrae, Major J. L. (I.M.S.)	... Anantapur.
Macwatt Lieut.-Col. R. C. (I.M.S.) ...	... Bombay.
Madras Forest College, The Principal ...	... Coimbatore.
Madras, The Librarian, Govt. Central Museum	... Madras.
Madras, The Principal, Presidency College	... Madras.
Madras, The Professor of Zoology, Christian College.	Madras.
Magrath, Lt.-Col., H. A. F.	... Kohat.
Mahaluxmiwalla, C. D.	... Bombay.
Mahomedbhoy Currimbhoy Ebrahim ...	... Bombay.
Mahon, E. L.	... Pollibetta.
Main, T. F.	... Poona.
Forbes Major	... Bombay.
Maltby, C. M.	... Bombay.
Manavadar, Khan Shree Fatehdinkhan, Chief of (*Life Member*)	... Kathiawar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Manders, Lt.-Col. N. (R.A.M.C., F.Z.S., F.E.S.) (*Life Member*) ... ... *Europe.*
Mandlik, Narayan V. (*Life Member*) ... ... Bombay.
Mann, Dr. H. H. ... ... Poona.
Mann, T. H. ... ... *Europe.*
Manners-Smith, Lt.-Col. J. (V.C., C.I.E.) C.V.O. ... *Europe.*
Marjoribanks, N. E. (I.C.S.) ... ... Vellore.
Marjoribanks, Major J. L. (I.M.S.) ... ... Nasik.
Marriott, R. G. ... ... Bahraich.
Marryatt, N. ... ... *Europe.*
Marshall, Arch. McL. (*Life Member*) ... ... *Europe.*
Marshall, A. W. ... ... *Europe.*
Marshall, D. ... ... Madras.
Marshall, Dr. H. H. (L.R.C.S.)... ... ... Rangoon.
Marshall, J. McL. (*Life Member*) ... ... *Europe.*
Marshall, Major T. E. (R.A.) ... ... Quetta.
Marten, James ... ... Mussoorie.
Martin, A. Ff. ... ... Ramnad Dist., S. I.
Martin, Col. Gerald (*Life Member*) ... ... *Europe.*
Martin, Capt. J. ... ... Baroda.
Martin, L. K. ... ... *Europe.*
Martindell, H. E. W. ... ... Maymyo, Burma.
Masani, A. M. (*Life Member*)... ... ... Baroda.
Mason, C. W. ... ... *Europe.*
Masson, The Hon'ble Sir D. P. (K.C.I.E.) ... *Europe.*
Massy, Capt. W. J. ... ... Myitkyina.
Maung, Po Bye (K.S.M. & F.R.C.I.) ... ... Myaung-Mya, Burma.
Maunsell, Capt. E. C. C. (I.M.S.) ... ... Cochin.
Maxwell, Lt.-Col. J. (R.F.A.) ... ... Jubbulpore.
Maxwell, Major L. L. ... ... *Europe.*
Maxwell, R. M. (I.C.S.) ... ... Karwar, Kanara.
Maxwell, Capt. W. F. (R.E.) ... ... *Europe.*
Mayes, W. ... ... Abbottabad.
Mayne, Major H. B. (R.G.A.) ... ... Ferozepore.
McCarrison, D. L. (D.S.P.) ... . *Europe.*
McCleverty, G. M. ... ... Dehra Dun.
McComas, H. ... ... Lucknow.
McCrie, C. M. (I.F.S.) ... ... Dehra Dun.
McCudden, Capt. J. H. ... ... Poona.
McDiarmid, K. ... ... Shwebo, Burma.
McDonald, Capt. E. J. C. (I.M.S.) ... ... Assam.
McDonald, J. ... ... Bombay.
McGlashan, John (C.E.) ... ... Calcutta.
McIlwrick, L. ... ... Bombay.
McIntosh, Alex. (C.E.) ... ... Trichinopoly.
McIntosh, R. (I.F.S.) ... ... Chamba, Punjab.
McKendrick, Capt. A. G. (I.M.S.) ... ... Coonoor.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

McKenel, A.	... Insein, Burma.
McKerron, R. G. (M.A., I.C.S.) ...	... Rangoon.
McMahon, Col. The Hon. Sir A. H. (K.C.I.E., G.C.V.O., C.S.I.).	... Delhi.
McMullen, Capt. G. C.	... Amritsar.
McNeale, J. H.	... Buldana, Berar.
McNeill, J. (I.C.S.)	... *Europe.*
McPherson, Major G. (I.M.S.)... ...	... Bombay.
McPherson, Capt. J. (I.M.S.)	... Bombay.
Mead, P. J. (I.C.S.)	... Ahmednagar.
Mears, Major A. (I.A.)	... Calcutta.
Meikle, H. G. W.	... Delhi.
Meinertzhagen, Capt. R.	... Quetta.
Meilor, J. E. M.	... Amballa.
Mendoza, V. A.	... Bombay.
Menon, K. G.	... Trichoor, Cochin.
Mercer, A. W.	... Rawalpindi.
Mercer, D.	... Bombay.
Merrikin, M. S.	... Burma.
Mess President, R. A. Mess	... Colaba.
Mess President, R. A. Mess	... Roorkee.
Mess Secretary, R. A. Mess	... Cambellpore.
Mess Secretary, R. A. Mess	... Meerut.
Mess President, The King's Liverpool Regiment, 2nd Battln.	... Lahore Cantonment.
Mess President, Leicestershire Regt. ...	... Raniket.
Mess President, 1st South Wales Borderers	... *Europe.*
Mess President, 1st Connaught Rangers	... Dagshai.
Mess President, The 1st Border Regiment	... Maymyo.
Mess President, 1st Battalion, The Royal Scots	... Allahabad.
Mess President, 2nd Worcestershire Regt.	... Jhansi.
Mess Secretary, 5th Ammunition Column, R. F. A.	Deesa.
Mess President, 6th Jat. Light Infantry	... Secunderabad.
Mess President, 7th Hussars	... Bengalore.
Mess President, XI K. E. O. Lancers ...	... Delhi.
Mess Secretary, 18th Infantry ...	... Aden.
Mess Secretary, 1/39th Garhwal Regiment	... Lansdowne, U. P.
Mess President, 41st Dogras	... Cawnpore.
Mess President, 42nd Deoli Regiment ...	... Rajputana.
Mess President, 44th Merwara Infantry	... Ajmer.
Mess President, 45th Rattray's Sikhs ...	... Dera Ismail Khan.
Mess President, 52nd Sikhs, F. F. ...	... Peshawar.
Mess Secretary, 58th Rifles, F. F. ...	... Quetta.
Mess Secretary, 59th Scinde Rifles ...	... Kohat.
Mess President, 62nd Punjabis ...	... Benares.
Mess President, 64th Pioneers ...	... Secunderabad.
Mess Secretary, 74th Punjabis, Book Club	... Lucknow.
Mess President, 85th Regiment (K.S.L.I.)	... Secunderabad.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mess Secretary, 87th Punjabis ...	... Jhelum.
Mess President, 90th Punjabis ...	... Nasirabad.
Mess President, 98th Infantry ...	... Saugor.
Mess President, 101st Grenadiers ...	... Bangalore.
Mess President, 103rd Mahratta Lt. Infy.	... Ahmednagar.
Mess Secretary, 109th Infantry ...	... Secunderabad.
Mess President, 110th Mahratta L. Infantry	... Belgaum.
Mess President, 117th Marathas ...	... Poona.
Mess President, 122nd Infantry ...	... Fort Sandeman.
Mess Secretary, 39th C. I. Horse ...	.. Shiraz, Persian Gulf.
Mess President, 1/10th Gurkhas ...	... Maymyo.
Mess Secretary, R. I. M. S. "Dufferin"	... Bombay.
Messent, P. G. (C.E.)	... Bombay.
Metcalfe, J. G. E.	... Bombay.
Meyer, Carl	... Rangoon.
Meyer, O.	... Bombay.
Meyrick, E. (F.R.S.)	... *Europe.*
Millard, W. S. (F.Z.S.) (*Life Member*) ...	... Bombay.
Miller, W. A. H.	... Karwar.
Millett, Hon'ble Mr. G. P. (I.F.S.) ...	... Poona.
Mills, J. D. (*Life Member*)	... *Europe.*
Milner, C. E.	... Tharrawaddy.
Milward, R. C. (I.F.S.)	... Chakratta.
Minns, Mrs. H. C.	... Rangoon.
Miraj, Shrimant Gungadhar Rao Ganesh, *alias* Baba-saheb Patwardhan, Chief of (*Life Member*)	... Miraj.
Mitchell, F. J.	... *Europe.*
Mitchell, R. St. J.	... Nanded Dn.
Mitchell, H. H. G.	... Madras.
Mitchell, J. C. H.	... Kampong Batn P.O. Nagri Sambilan, F. M. S.
Mockler, Major G. F.	... Bombay.
Mody, Bomanji Edulji	... Surat.
Moggridge, C. B.	... Pyinmana.
Mohun Shumshere Jung Bahadur, General	... Nepal.
Mollison, J.	... *Europe.*
Montagnon, D. J.	... Sylhet.
Monté, Dr. D. A. de (L.M. & S.) ...	... Bandra.
Monteath, G. (I.C.S.) (*Life Member*) ...	... Karwar.
Monteath, J. (I.C.S.)	... Bombay.
Montgomerie, A. (I.C.S.)	... Ahmednagar.
Montgomerie, C. W. E. (I. C. S.) ...	... Jubbulpore.
Montgomery, Miss E. A.	... Broach.
Montmorency, G. F. de (I. C. S.) ...	... Delhi.
Montresor, Capt. L. B. (R.F.A.) ...	... *Europe.*
Moore, J.	... Korapat.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Moore, T. D.	... Bombay.
Moore, W. (F.I.C.)	... Bombay.
Moore, W. G.	... Mandalay.
Morgan, Mrs. Chas.	... Mangalore.
Morgan, R R.	... Monghir.
Morris, Major A. H. (R.A.M.C.) ...	... *Europe.*
Morris, A. P. (B.SC.)	... Insein.
Morris, Major D. O.	... Amraoti, Berar.
Morris, Major G. M.	... Rawalpindi.
Mosley, Capt. N.	... Bombay.
Mosse, Capt. A. H. E. (*Life Member*) ...	... *Europe.*
Motilal Vallabhji	... Bombay.
Moule, Capt. H. E.	... Falam, Burma.
Mowbray, G. B. De...	... Maskeliya, Ceylon.
Moylan, W. M.	... Jamtee, C. P.
Moysey, E. L. (I.C.S.)	... *Europe.*
Mudhol, Shrimant Malojirao Raje Ghorpade, Chief of	... Mudhol, S. M. C.
Muir, G. B. F. (I.C.S.)	... Karwi, Banda Dist.
Mullan, J. P. (M.A.)	... Bombay.
Muller, C. H. A.	... Quetta.
Müller, Professor O. V.	... *Europe.*
Mullings, C. T.	... Rajahmundry.
Mullins, Bt.-Col. W. B.	... Chaman.
Mulraj, Lala	... Quetta.
Mumford, J.	... *Europe.*
Mundy, B. H. H. (F.R.G.S.)	... Bombay.
Mundy, N. S.	... Silchar, Cachar.
Munn, Leonard	... Secunderabad.
Murison, Major C. C. (I.M.S.) ...	... Bombay.
Murphy, Capt. A. (I.M.S.)	... *Europe.*
Murphy, E. J.	... Monywa, U.Burma.
Murray, A. G.	... Nelliampatty.
Murray, Lt. J. Wolfe (R. N.) ...	... *Europe.*
Murray, Capt. J. H. (I.M.S.)	... Bombay.
Murray, R. A. C.	... Agra.
Murray, R. D.	... Kasauli.
Murray, S. B. (P.W.D.)	... Madras.
Muspratt, Lt.-Col. F. C.	... Bombay.
Mysore, Agricultural Chemist ...	... Bangalore.
Mysore, The Superintendent, Mysore Government Museum	... Bangalore.
Mysore, H. H. the Maharaja Krishna Raj Woodayar Bahadoor (G.C.S.I.) (*Life Member*) ...	... Mysore.
Nahar Singh of Bedla, Rao	... Bedla near Udaipur.
Nanavati. D. D., (I.C.S.)	... Burma.
Nangle, Capt. M. C.	... Rangoon.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Napier, A. G. Fitz....	... Rangoon.
Napier, Capt. A. H. (I.M.S.)	... Alipore.
Naranji Dwarkadas (*Life Member*) ...	... Bombay.
Narrotumdas Morarji Goculdass (*Life Member*)	... Bombay.
Nash, H. J.	... Bulsar.
Nasrulla Khan, H. H. Nawab Mahomed	... Bhopal, C. I.
Neale, Capt. W. G. (I.A.)	... Rajputana.
Needham, J. E.	... Bombay.
Nene, Sadashive Sitaram	... Sangamner, Ahmednagar Dist.
Nevill, Capt. G. A....	... Sadiya, Assam.
Nevill, Humphry	... Lahore.
Nevill, T. N. C.	... *Europe.*
Newcome, Lionel	... Shanivarsante P.O. N. Coorg, S. India.
Nichol, Col. C. E. (D.S.O., R.A.M.C.) ...	... Calcutta.
Nicholetts, W. A.	... Assam.
Nicholls, W. A.	... Campbellpore.
Nicholson, E. F. (F.Z.S.)	... Bombay.
Nicholson, Capt. E. H.	... Chakratta.
Nicholson, E. M. F.	... Bombay.
Nicholson, Major W. C.	... Ferozepore.
Nisbett, Major W. G.	... *Europe.*
Nisht, R. H.	... Siam.
Nixon, Capt. F. B....	... *Europe.*
Nizam's College, The Librarian ...	... Hyderabad, Deccan.
Norman, Major H. H. (R.A.M.C.) ...	... *Europe.*
Noyce, F. (I.C.S.)	... Simla.
Nurse, Lt.-Col. C. G. (F.E.S.) (*Life Member*)	... *Europe.*
Nuttall, W. M.	... Dibrugarh.
Oberholser, H. C.	... Washington, U.S.A.
O'Brien, Major Edward	... *Europe.*
O'Brien, Capt. H. C. H.	... *Europe.*
O'Brien, P.	... Mirpurkhas, Sind.
O'Callaghan, T. P. M.	... Sadiya.
O'Connell, Dr. J. M.	... Ceylon.
O'Donel, H. V.	... Alipur, Duars.
O'Donnell, O.	... *Europe.*
O'Nash, E.	... Calcutta.
Ogilvie, A. W. (I.F.S.)	... Papun, Burma.
Ogilvie, G. H. (I.F.S.) (*Life Member*) ...	... Burma.
Ogilvy, W.	... U. Burma.
Ogston, Mrs. W. H.	... Bombay.
Okeden, W. P.	... Rangoon.
Oliphant, J.	... *Europe.*
Oliphant, J. N.	... Bahraich.
Oliver, A. W. L.	... China.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Oliver, Lt.-Col. L. G.	... Allahabad.
Olivier, Col. H. D. (R.E., F.Z.S.) (*Life Member*)	... *Europe.*
Ollenbach, O. C.	... Dehra Dun, U. F.
Orchha, H. H. the Raja Bhagvunt Singji	... Tikumgarh, Bundelkhund.
Ormiston, W.	... Ceylon.
Orr, Capt. H. M. C.	... *Europe.*
Orr, J. P. Hon'ble Mr. (I.C.S., C.S.I.) ...	... Bombay.
Osmaston, A. E. (I.F.S.)	... Garhwal.
Osmaston, B. B. (I.F.S.)	... Naini Tal.
Osmaston, L. S. (I.F.S.)	... *Europe.*
O'Sullivan, Col. D. (R.A.M.C.) ...	... *Europe.*
Owen, W. Tudor (I.C.S.)	... Junagadh.
Oxley, Capt. J. C. S. (I.M.S.)	... Chanda.
Paddison, G. F. (I.C.S.)	... Madras.
Page, A. G. (I.C.S.)...	... Nyaunglebin.
Page, W. G.	... *Europe.*
Page, W. T. (F.Z.S.)	... *Europe.*
Paget, Dr. A. J. M. (M.D., &c.) ...	... Berbera, Somaliland
Paget, B. C. T.	... Wellington, Nilgiris
Painter, H. L. (I.C.S.)	... Bombay.
Palanpur, Nawab Zada Paley Mahomed Khan	... Palanpur.
Palmer, Capt. C. E. (I.M.S.)	... Benares.
Palmer, W. L. (I.F.S.)	... *Europe.*
Panday, Mrs. J. L.	... *Europe.*
Pandit, S. Prem N...	... Jaipur, Rajputana.
Panna, H. H. the Maharaja Mohendra... Yadvendra Singh Bahadur... ...	... Ajmer.
Parames, N. V. (C.S.)	... Ernakulam, Cochin.
Pargeter, C. E.	... *Europe.*
Parish, N. B.	... Alwar, Rajputana.
Parker, R. N. (I.F.S.)	... Lahore.
Parnell, R. (I.F.S.)	... Lahore.
Parrington, Capt. J. W. (R.A.) ...	... Bangalore.
Parshotumdas Vishram Maoji ...	... Bombay.
Parsons, A. A. L. (C.S.)	... Simla.
Parsons, A. E. B.	... Peshawar.
Parsons, S. R.	... Buldana, Berar.
Partridge, E. A.	... Deccan.
Parton, F. J.	... Koppa P. O., Kadur District.
Pascoe, J. Harding	... Nilgiris.
Pasteur Institute of India, The Director	... Kasauli, Punjab.
Patel, Khan Bahadoor Burjorji D. ...	... Quetta.
Patiala, H. H. the Maharaja of (*Life Member*)	... Patiala.
Patton, Capt. W. S. (I.M.S.)	... Madras.
Patuck, P. S. (I.C.S.)	... Wardha.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Payne, R. (B.A.)	... Bankipur, E. I. Ry.
Pearce, Major C. R. (I.M.S.)	... Maymyo.
Pears, S. G. (I.C.S.)...	... Parachinar.
Pearse, Lt.-Col. J. L.	... *Europe.*
Pearson, G. H. A.	... Dalhousie.
Pearson, R. S. (I.F.S.)	... Dehra Dun, U. P.
Pearson, Major W. B.	... Multan.
Pechey, W. P.	... *Europe.*
Peck, N. F. (I.C.S.)	... Dinapore, Bihar.
Peile, Major H. D. (I.M.S.)	... Bannu.
Pendlebury, W. M. F.	... Secunderabad, Deccan.
Pentland, Lord (P.C., G.C.I.E.) ...	... Madras.
Percival, A. P. (I.F.S.)	... *Europe.*
Percival, G. S. P.	... *Europe.*
Percy-Rae, A. E.	... Rangoon.
Perfect, S. R. (P.W.D.)	... Karachi.
Perreau, Capt. G. A.	... *Europe.*
Pershouse, Capt. S.	... Rangoon.
Pestonji Jivanji (N.C.S.) (*Life Member*)...	... Hyderabad, Deccan.
Peters, C. R.	... Benares.
Peters, Col. C. T. (I.M.S. retd.) ...	... Dinajpur.
Petit, Bomanji Dinshaw (*Life Member*)...	... Bombay.
Petit, Dhunjibhoy Bomanji (*Life Member*)	... Bombay.
Petit, Jehangir Bomanji (*Life Member*)	... Bombay.
Petit, Phirozsha Bomanji	... Bombay.
Petley, C. A.	... Toungoo.
Phillimore, Capt. R. H. (R.E.) ...	... Maymyo.
Phillips, J. R.	... Burma.
Phillips, W. W. (I.C.S.)	... Madras.
Phipson, H. M. (F.Z.S.) (*Life Member*)...	... *Europe.*
Phythian, Adams, Lt. E. G. P. ...	... Rangoon.
Pickersgill-Cunliffe, Lt. J. C. ...	... Jhansi.
Pickthall, Capt. J. W.	... Rangoon.
Pilcher, Col. J. G. (I.M.S.)	... *Europe.*
Pile, J.	... Secunderabad.
Pinfold, E. S.	... Rangoon.
Pinhey, The Hon'ble Lt.-Col. A. F. (C.I.E.)	... Hyderabad, Deccan.
Pipe, T. S.	... Poona.
Pitman, C.R.S.	... Derah Ismael Khan
Pitt, W. H.	... Rajakimundi.
Player, H. B.	... *Europe.*
Plunkett, P. E.	... Katha, U. Burma.
Pollard, Capt. A. E. St. V.	... Bombay.
Pollard, G. F. (F.Z.S.)	... Tehri, Garhwal.
Poncins, Baron Edmond de (*Life Member*)	... *France.*
Ponsonby, W. G.	... Purna.
Pope, J. A. (I.C.S.)	... Satara.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Porter, A. A. ... ... Lakon, U. Siam.
Pottinger, Lt. J. A. ... ... Jhansi.
Pottinger, Major R. S. ... ... Bombay.
Powalla, Jamsetji C. ... ... Bombay.
Powell, Dr. A. ... ... Bombay.
Powell, J. E. ... ... Ghazipur.
Powell, V. N. F. ... ... Beawar.
Powell, W. ... ... *Europe.*
Powell, W. S. (I.F.S.) ... ... Rangoon.
Praed, Capt. G. A. M. ... ... Nowgong.
Prall, Lt.-Col. S. E. (I.M.S.) ... ... Aden.
Pratt, H. C. ... ... Selangor.
Prendergast, H. H. L. ... ... Arkonam.
Preston, F. J. ... ... Bombay.
Priestley, E. ... ... Belgaum.
Primrose, Alex. M. ... ... Punkabari, Duars.
Principal, Agricultural College and Research Institute ... ... Coimbatore.
Procter, The Hon'ble Sir H. E. ... ... Bombay.
Proctor, Capt. Alfred H. (I.M.S.) ... ... Meerut.
Professor of Forestry, Oxford University ... *England.*
Punjab Agricultural College, The Principal ... Lyallpur.
Punjab Government Horticultural Gardens, Supdt. Lahore.
Purkis, F. C. (B.F.S.) ... ... Rangoon.
Purkis, H. V. ... ... Bhadarwa *via* Jummu.

Quin, Capt. R. P. ... ... Cawnpore.
Quinlan, D. (M.R.C.V.S.) ... ... Ranchi.
Quinn, Dr. T. W. ... ... Betul, C. P.
Quarry, P. S. ... ... Jessore.

Radford W. J. ... ... Bangalore.
Rae, Capt. M. E. (*Life Member*) ... ... Chitral.
Raikes, E. B. ... ... *Europe.*
Rajkumar College, the Principal ... ... Rajkote.
Ralston, Capt. W. H. ... ... Jullundur.
Randle, H. H. ... ... Benares.
Raper, J. C. D. (A.M.I.C.E.) ... ... Lanowli.
Ravenshaw, Col. C. W. (*Life Member*) ... ... *Europe.*
Rawalpindi Club, The Secretary ... ... Rawalpindi.
Readymoney, N. J. ... ... Bombay.
Rearden, T R. ... ... *Europe.*
Rebello, Rev. João ... ... Margao, Goa.
Rector, St Mary's College ... ... Mazagon, Bombay.
Reed, W. H. ... ... Kolasa P. O.
Rees, R. ... ... Chandkhira, Sylhet.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Rees, W. E. ... ... Gaya, Bengal.
Reeve, C. F. ... ... Nasarpur.
Reichwald, Capt. W. F. (R.H.A.) ... ... Mhow.
Reid, Cecil H. (I.C.S.) ... ... Calcutta.
Reid, Hon'ble Mr. M. F. (C.I.E.) ... ... Bombay.
Reid, W. J. (I.C.S.)... ... ... Dacca.
Reiley, R C. ... ... Balaghat, C P.
Reilly, Capt. N. E. ... ... Peshawar.
Reinhold, Capt. C. H. (I.M.S.) ... ... Quetta.
Remington, G. L. ... ... Bombay.
Rendall, H. D. (I.C.S.) ... ... Junagadh.
Rennick, Capt. Alex. de C. ... ... Delhi.
Rennie, Thos. (I C.V.D.) ... ... Rangoon.
Reynolds, Capt D. (R.F.A.) ... ... Nowshera.
Reynolds, Capt. G. N. ... ... Saugor, C. P.
Reynolds, L. W. (I.C.S.) ... ... Calcutta.
Rhenius, C. E. ... ... Coconada.
Rhodes, T. M. ... ... *Europe.*
Rice, F. E. ... ... *Europe.*
Rice, H. D. ... ... *Europe.*
Richards, B. D. (B. SC.) ... ... Lanowli.
Richmond, R. D. (I.F.S.) ... ... Coimbatore.
Robert, A. W. ... ... Tanjore.
Roberts, A. A. Lane (I.C.S.) ... ... Lahore, Punjab.
Roberts, Capt. A. S. B. ... ... Rangoon.
Roberts, Lt.-Col. J. R. (I.M.S., C.I.E.) ... ... Indore, C. I.
Roberts, Lt.-Col. M. B. (*Life Member*) ... ... *Europe.*
Robertson, Hon'ble Sir B. (I.C.S., C.I.E., K.C.S.I.) ... ... Nagpur, C. P.
Robertson, J. H. (I.C.S) ... ... Bellary.
Robertson, Laurence (I.C.S.) ... ... *Europe.*
Robertson, L. V. M. (I.C.S.) ... ... Kaira.
Robinson, H. C. ... ... Kula Lumpur.
Robinson, H K. (I.F.S.) ... ... *Europe.*
Robinson, Hon'ble Mr. Justice S. M. ... ... Rangoon.
Robinson, Major H. A. ... ... Poona.
Rocke, Capt. C. A. ... ... Montgomery.
Roddis, F. ... ... *Europe.*
Rodger, A. (I.F.S.) ... ... *Europe.*
Rogers, A. C. ... ... *Europe.*
Rogers, C. G. (I.F.S.) ... ... Bombay.
Rogers, J. B. Leslie ... ... Bombay.
Rogers, Rev. K. St. A. ... ... *Europe.*
Rogers, W. S. ... ... Bombay.
Rome, H. C. ... ... Landi Kotal.
Roper, F. ... ... *Europe.*
Rorie, J. J. ... ... Bhamo Burma.
Rose, Col. H. ... ... *Europe.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Rosenthal, F. M. ... ... *Europe.*
Ross, J. P. ... ... Bombay.
Ross, Major Tyrell (*Life Member*) ... ... *Europe.*
Routh, Capt. G. F.... ... ... Kohat.
Roughton, N. J. ... ... Khandwa.
Row, Dr. R. (M.D.) ... ... Bombay.
Rowlandson, E. J. S. ... ... Calicut.
Royal Asiatic Society, The Honorary Secretary ... Bombay.
Ruddle, W. H. ... ... *Europe.*
Rudman, F. R. R. (I.C.S). ... . Mandla.
Rumboll, A. C. ... ... Bombay.
Rushton, C. E. ... ... Mandalay.
Russell, A. J. .. .. Rangoon.
Russell, Hon'ble Mr. Justice L. P. ... ... *Europe.*
Rust, P. J. (I.C.S.) ... ... *Europe.*
Rutherford, W. F. ... ... China.
Ryan, G. M. (I.F.S.)... ... ... *Europe.*
Ryan, J. G. ... ... Cawnpore.
Ryan, W. J. N. ... ... *Europe.*
Rylands, H. R. ... ... *Europe.*
Ryves, The Hon'ble Mr. Justice A. E.... ... Allahabad.

Sabour, The Principal, College of Agriculture ... Sabour, Bengal.
Sale, Edward L. (I.C.S.) ... ... Bombay.
Salkeld, Capt. R. E.... ... ... *Kismayu, British East Africa.*
Salmon, Capt. W. H. B. ... ... Poona.
Sampson . D. ... ... Madras.
Sanders, A. D. ... ... Bellary.
Sanderson, P. M. D. ... ... Bombay.
Sangli, Shrimant Chintamanrao Appasaheb Patwardhan ... ... Sangli, S. M. C.
Saone, G. Prier De ... ... *Europe.*
Sassoon, Mrs. S. D. ... ... *Europe.*
Saxby, H. B. ... ... Ajmer.
Saunders, C. ... ... Calcutta.
Saunders, Capt. C. ... ... *Europe.*
Saunders, H. F. ... ... Gwalior, C. I.
Saunders, Major F. W. (R.E.) ... ... Bombay.
Savile, L. H. ... ... Bombay.
Scarlett, Capt. J. S. (R.H.A.) ... ... *Europe.*
Scindia, H. H. the Maharaja Sir Madhowrao (G.C.S.I., G.C.V.O.) (*Life Member*) ... ... Gwalior, C. I.
Schomberg, Capt. R. C. F. ... ... Taiping.
Schultz, Chas. S. ... ... *Europe.*
Scot, J. S. (I.F.S.) ... ... Madras.
Scott, Major A. ... ... Pachmarhi.
Scott, Edmund ... ... Ceylon.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Scott, Capt. G. B. ... ... Dera Ismailkhan.
Scott, G. B. ... . Ahwaz.
Scott, F. B. ... ... Mussoorie.
Scott, R. P. ... ... *Europe.*
Scrafton, Capt. J. E. B. ... ... Secunderabad.
Scribner, Staff Surgeon R. B. (R.N.) ... ... *Europe.*
Scroggie, Capt. W. R. J. (I.M.S.) ... ... Mercara, Coorg.
Scroope, H. W. P. (I.C.S.) ... ... *Europe.*
Secunderabad Club Library. The Honorary Secretary ... ... Secunderabad.
Selby, Major W. (D.S.O., F.R.C.S., I.M.S.) ... Lucknow.
Seale, Dr. C. E. B.... ... ... Darjeeling.
Sealy, Major A. E. ... ... Dalhousie, Punjab.
Sedgwick, L. J. (I.C.S.) ... ... Ahmedabad.
Seervai, Dr. Rustom F. ... ... Bombay.
Seychelles, Curator, Botanic Station ... ... Seychelles.
Seton-Karr, H. W. (*Life Member*) ... ... *Europe.*
Settlement Reading Club, The Principal ... Port Blair.
Sewell, J. H. ... ... Rangoon, Burma.
Seymour Sewell, Capt. R. B. (I. M. S.)... ... Calcutta.
Shand, J. H. B. (I.M.S.) ... ... Bombay.
Sharp, The Hon'ble Mr. W. H. ... ... Poona.
Sharp, The Hon'ble Mr. H. ... ... Delhi.
Shaw, Capt. W. S. J. (I.M.S.) ... ... Yerrowda.
Sheldon, Dr. J. H. ... ... Toungoo, Burma.
Shebbeare, E. O. ... ... Jalpaiguri.
Shepherd, Philip ... ... Quetta.
Shepherd, W. C. (I.C.S.) ... ... Bombay.
Shepperson, C. J. W. ... ... *Europe.*
Shevade, S. V. (B. SC.) ... ... Poona.
Shipp, W. E. ... ... Ajmer.
Shipman, Major H. J. ... ... Bombay.
Shirlay, G. S. ... ... Rangoon.
Shore, H. A. ... ... *Europe.*
Shortland, C. V. N. (A.M.I.C.E.) ... ... *Europe.*
Shortt, H. E. (I.M.S.) ... ... Benares.
Shoubridge, H. O. (C.E.) ... ... *Europe.*
Silvester, C. J. ... ... Moradabad, U. P.
Simcox, A. H. A. (I.C.S.) ... ... Jalgaon, Khandesh
Simonds, Capt. M. H. ... ... Ferozepore.
Simpson, J. Hope (I.C.S.) ... ... Gorakhpur, U. P.
Simson, Lt. R. ... ... Fyzabad.
Sinclair, R. L. ... ... Castle Rock.
Sind Club, The Hony. Secretary ... ... Karachi.
Sirdar Anandrao Scindia ... ... Gwalior, C. I.
Sitwell, Capt. N. S. H. (R.A.) ... ... *Europe.*
Skelton, J. H. ... ... Bombay.
Skene, G. A. ... ... Thayetmyo.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Skilling, W.	... Shillong.
Skinner, C. W.	... Dehra Dun.
Skinner, Miss A. L.	... Kuala Lumpur.
Skinner, Capt. J. M. (I.M.S.)	... Ganjam.
Skinner, Capt. R. B. (R.E.)	... *Europe.*
Skinner, R. R.	... Fort Bilaspur.
Slade, G. E. R.	... Bombay.
Slade, Rear-Admiral Sir E. J. Warre....	... *Europe.*
Sladen, J. (I.C.S.)	... Rajkot.
Sladen, Dr. R. J. L.	... Bira.
Slater, A. F.	... Aligarh.
Slater, H. Kelshall	... Bangalore.
Slater, J. Sanders	... Bombay.
Smallwood, H. St. C.	... Moulmein, Burma.
Smales, Chas. B. (I.F.S.)	... *Europe.*
Smart, Dr. A. G. M. (M. B.)	... Kelanton, *via* Singapore.
Smith, A. Kirke	... Bombay.
Smith, J. H.	... Cutch, Bhuj.
Smith, J. I. (I.C.S.)	... Koraput.
Smith, Major F. A. (I.M.S.)	... Indore, C. I.
Smith, Capt. H. H....	... Fyzabad.
Smith, W. R. G.	... Gadag, Dharwar.
Smith, Major O. A.	... Hazaribagh.
Smith, S. D. (B.A.)	... Bombay.
Smith, W. J.	... Colombo.
Smyth, L. D. G.	... Katha, Burma.
Sommers, W. B. (M.B.)	... Rangoon.
Somervaille, Geo.	... Bassein, L. Burma.
Souter, C. A. (I.C.S.)	... Madras.
Southon, Capt. C. E. (I.M.S.)	... Bombay.
Spalding, Capt. W. B.	... Cawnpore.
Sparke, W.	... Rangoon.
Sparling, A. H.	... Allahabad.
Sparrow, Major R.	... Trimulgherry.
Spence, A. D.	... Rangoon.
Spence, R. A.	... Bombay.
Spink, H. H. M.	... Ahmednagar.
Spooner, T. J. (C.E.) (*Life Member*) ...	... Belgaum.
Squire, D.	... *Europe.*
Stables, Major Alex. (R.A.M.C.) ...	... *Europe.*
Stack, Mrs. C. E.	... *Europe.*
Stakelum, E. R.	... Bombay.
Stallard, R. H. (R.E.)	... Sialkot.
Stanbridge, Capt. W. J.	... Roorkee.
Standen, B. (I.C.S., C.I.E.)	... Pachmarhi.
Stanton, W. C.	... Calcutta.
Staples, E. W. H. (C.E.)	... Dum Dum.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Stebbing, E. P. (I.F.S., F.L.S., F.E.S., F.Z.S.) ... *Europe.*
Steel, Capt. D. (I.M.S.) ... ... Bombay.
Steen, Capt. R. (I.M.S.) ... ... *Europe.*
Steffen, O. ... ... Bombay.
Stephens, L. B. ... ... Karachi.
Stevens, Herbert ... ... *Europe.*
Stevenson, Capt. F. (I.M.S.) ... ... Loralai.
Stevenson, Hon'ble Surg.-Genl. H. W. (I.M.S., C.S.I). Poona.
Stevenson, Capt. W. D. H. (I.M.S.) ... ... Bombay.
Stewart, C. G. ... ... Tharrawaddy, Burma.
Stewart, Dr. D B. ... ... Rangoon.
Stewart, Major G. E. (I.M.S.) ... ... Mahableshwar.
Stewart, Major G. H. (I.M.S.) ... ... Rangoon.
Stewart, John ... ... Travancore.
Stewart, Capt. J. M. ... ... Bombay.
Stirling, J. H. ... ... Jodhpur, Rajputana.
Stockley, Capt. C. H. ... ... Barrackpore.
Stockley, Capt. J. P. ... ... Kotra, Rajputana.
Stodart, J. C. (I.C.S.) ... ... Pollachi.
Stokes, I. W. ... ... Bombay.
Stone, F. H. S. ... ... Bombay.
Stoney, R. F. ... ... Madras.
Stoner, W. ... ... Nagasamudram, S. M. Ry.
Storey, Thos. H. ... ... Oodeypur.
Story, S. S. ... ... Bombay.
Street, E. ... ... Mandalay.
Stringfellow, H. P. ... ... Bombay.
Strong, F. W. (I.C.S.) ... ... *Europe.*
Strong, R. P. W. ... ... Bombay.
Stuart, C. J. ... ... Nellore.
Stuart, G. A. D. (I.C.S.) ... ... Madras.
Stuart, J. D. ... ... *Europe.*
Stubbs, L. M. (I.C.S.) ... ... *Europe.*
Sulivan, Col. G. D. F. ... ... Kashmir.
Sullivan, E. H. ... ... Madanapalli.
Surveyor, Dr. N. F. (M.D.) ... ... Bombay.
Suter, Dr. M. F. ... ... Bombay.
Sutherland, Rev. W. S. ... ... Kalimpong.
Swinhoe, Col. C. ... ... *Europe.*
Sydenham, Lord (F.R.S., G.C.M.G., G.C.I.E., G.C.S.I.) ... Bombay.
Sykes, C. M. (C.E.) ... ... Dwarka.
Sykes, Sir Tatton, Bart. ... ... *Europe.*
Symes, W. C. ... ... *Europe.*
Symons, H. (R.G.A.) ... ... Kirkee.
Symons, C. T. ... ... Colombo.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Talbot, A. D.	... Multan.
Talbot, W. A. (I.F.S.)	... Kirkee.
Tambe, Dr. Gopal Ramchandra (M.A., B.SC., L. M. & S.).	Indore, C. I.
Tanner, Major C. O. O.	... Karachi.
Taskar, T. J. (I.C.S.)	... Hospet.
Tata, Sir Dorabji J. *(Life Member)* ...	... *Europe.*
Tata, Ratan (*Life Member*)	... Bombay.
Taylor, Capt., E. C. (I.M.S.)	... Parachinar.
Taylor, Capt. J.	... *Europe.*
Taylor, James H.	... *Europe.*
Taylor, L. E., A.M. I.C.E.	... Dharwar.
Taylor, H. W. O. (B.SC., A.M.I.C.E.) ...	... Satara.
Tejpal, Goverdhandas Goculdas *(Life Member)*	... Bombay.
Tenison, Lt. W. P. C. (R.F.A.) ...	... *Europe.*
Tennant, G. F. D.	... Bombay.
Tew, G. C. (I.C.S.)	... Pyinmana.
Thom, W. S.	... Paletwa, Aracan Hill Tracts.
Thomas, E. F. (I.C.S.)	... Madras.
Thomas, M. P.	... Chandpur.
Thomasset, H. P.	... Seychelles.
Thomason College, The Principal ...	... Roorkee.
Thompson, Miss A.	... Betul, C. P.
Thomson, Major D. B.	... *Europe.*
Thomson, Lt.-Col. Henry (I.M.S.) ...	... Calcutta.
Thomson, F. P.	... Shwegyin.
Thompson, R. H. E. (I.F.S.)	... *Europe.*
Thompson, Major W. G. (R.H.A.) ...	... *Europe.*
Thomson, Capt. W. M. (I.M.S.) ...	... Chaubattia, U. P.
Thornhill, Lt.-Col. Sir H. B. (K.C.I.E.) ...	... Dehra Dun.
Thornton, Capt. F. E.	... *Europe.*
Thornton, H. A. (I.C.S.)	... Lashio, Shan States
Thorpe, Capt. L. L. G. (R.A.M.C.) ...	... *Europe.*
Thring, Lt.-Col. R. H. D.	... Jubbulpore.
Thruston, L. A.	... Mandalay.
Thubron, J. B. S.	... Aden.
Thuillier, Major H. F. (R.E.)	... Ahmednagar.
Thullier, Capt. L. C. (I.A)	... Bombay.
Thurn, Count	... Bombay.
Tibbs, Rev. P. G.	... Bombay.
Tilly, T. H. *(Life Member)*	... Canada.
Tinley, Col. G. F. N.	... *Europe.*
Tipper, G. H. (B.A.)	... Calcutta.
Tipping, P. G.	... Sidapur, Coorg.
Tod, Alex. M.	... Bombay.
Tomkins, Major E. L. (R.A.)	... Jubbulpore.
Tomlinson, Capt. W. Paget, 7th Hussars	... Bangalore.
Toppin, S. M. (R. A.)	... Bhamo, Burma.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Tottenham, W. F. L. (I.F.S.) ... . Pokokku, Burma.
Townsend, Lt.-Col. E. C. ... ... *Europe.*
Traill, W. H. ... . Jhansi.
Travancore, H. H. The Maharaja Sir Sultan Rama Raja Bahadoor (G.C.S.I., G.C.I.E.) (*Life Member*). Trivandrum.
Travers, W. L. ... ... Jalpaiguri.
Treeby, H. F. ... ... Ambala.
Trench, C. G. C. (I.C.S.) ... ... *Europe.*
Trevor, C. G. (I.F.S.) ... ... Kulu, Kangra Dist.
Trivandrum, The Director, Government Museum and Public Gardens ... ... Trivandrum.
Trotter, E. W. ... ... Bangkok, Siam.
Troup, N. F. T. ... ... Kousanie, Almora.
Troup, R. S. (I.F.S.)... ... ... Dehra Dun.
Truninger, L. ... ... Calcutta.
Tunstall, A. C. ... ... Calcutta.
Turkhud, Dr. D. A.... ... ... Bombay.
Turner, A. J. (B.SC.)... ... ... Bombay.
Turner, H. G. ... ... *Europe.*
Turner, Sir Montague ... ... *Europe.*
Tweedie, A. G. ... ... Calcutta.
Tweedie, Capt. J. L. ... ... *Cairo.*
Twiss, Capt. A. M. (R.E.) ... ... Kirkee.
Tyabji, S. B. ... ... Sholapur.
Tyler, H. H. F. M. (I.C.S.) ... ... Madras.
Tyrrell, Major J. R. (I.M.S.) ... ... *Europe.*
Tytler, Lt.-Col. H. C. ... ... Manipur.

United Service Club, The Secretary ... ... Bangalore.
United Service Library, Hon. Secretary ... Poona.
Unwalla, J. N. (*Life Member*)... ... ... Bhavnagar.
Urwin, Capt. J. J. ... ... Motihari, B.-N. Ry.
U. S. Department of Agriculture, The Librarian ... *Washington D. C.*

Vakil, J. D. ... ... Bhavnagar.
Van Ingen, E. M. ... ... Mysore.
Varvill, M. N. ... ... Bombay.
Vaughan, W. (F.E.S.) (*Life Member*) ... ... *Europe.*
Venning, Capt. F. E. W. (*Life Member*) ... Pyawbwe, Burma.
Venour, Major W. E. (I.A.) (*Life Member*) ... Kohat.
Vernon, C. V. (I.C.S.) ... ... Karwar.
Vernon, H. A. B. (I.C.S.) ... ... *Europe.*
Victoria College, The Principal ... ... Palghat.
Victoria Technical Institute, The Curator and Librarian ... ... Nagpur.
Villar, A. R. ... ... Tharrawaddy.
Vincent, W. H. H. (I.C.S.) ... ... Calcutta.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Vijayarajji, Maharaj Kumar Shri	Bhuj, Cutch.
Vithuldas Damodhar Thakersey, The Hon'ble Sir....	Bombay.
Vlasto, P.	Bombay.
Volkart, L.	Bombay.
Waddington, T. H. (I.F.S.)	*Europe.*
Wainwright, F. M....	Gudivada, Kistna.
Waite, H. W.	Delhi.
Wakefield, G. C. E.	Hyderabad, Deccan.
Walker, J. S. E.	Motihari, Bengal.
Walker, Capt. W. B. (R.A.)	Kirkee.
Walker, Major W. R.	Cownpore.
Wall, Major F. (I.M.S., C.M.Z.S.)	Almora.
Wall, M. G.	Punjab.
Wallace, John (C.E.)	Bombay.
Wallace, R.	Bombay.
Wallace, Lt. R.	Satara.
Wallace, W. V. (I.C.S.)	Burma.
Wallinger, W. A.	*Europe.*
Walsh, E. P. (I.C.S.)	Rajahmundry.
Walsh, W.	Burma.
Walters, O. H.	Rawalpindi.
Walton, Major H. J. (I.M.S., C.M.Z.S.)	Bombay.
Warburton, A. P.	Kindat.
Warburton, H. G. (I.C.S.)	Lucknow.
Ward, Col. A. E.	*Via* Haldwani, R. and K. Ry.
Ward, Major C. H.	Colombo.
Ward, W.	Ootacamund.
Wardrop, Major A. E.	Meerut.
Ware, F.	Madras.
Warner, Granville Lee	Jubbulpore.
Wasey, G. K.	*Europe.*
Waterfield, E. H. (I.C.S.)	Poona.
Watney, Capt. C. W.	Peshawar.
Watson, Capt. H. R.	Bangalore.
Watson, H. W. A. (I.F.S.)	Mogok, Burma.
Watson, Major J. W. (I.M.S.)...	Bharatpur.
Watson, W. M.	*Europe.*
Watts, Major G. A. R.	Quetta.
Watts, N. H. L.	Mandalay.
Way, J. D.	Vizagapatam.
Webb, G. R.	*Europe.*
Webb, M. (I.C.S.)	Hyderabad, Sind.
Webb, W. K.	Sonada.
Webb, J. E.	Calcutta.
Webster, J. R.	Bombay.
Webster, Lieut. D. (R.N.)	*Europe.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Welchman, G. H. ... ... Ganjam.
Weldon, W. L. ... ... Bombay. [S. Ry.
Weller, A. O. ... ... Kanchrapara, E. B.
Wells, Capt. F. W. A. ... ... Toungoo, U. Burma.
Wells, Dr. H. E. (M.B.) ... ... Minbu.
Wells, Capt. R. T. (I.M.S.) ... ... Bombay.
Welman, P. H. ... ... Bombay.
Wenden, H. (C.E., C.I.E.) ... ... *Europe.*
Weston, A. T. ... ... Hminelongyee, L. Burma.
Weston, W. V. ... ... Sylhet.
Whailey, G. P. ... ... Saidpur.
Whately, Richard ... ... Bombay.
Wheatley, Major P. (R.F.A.) ... ... Mhow, C. I.
Whiffin, D. ... ... Panposh, B.-N. Ry.
Whistler, Hugh ... ... *Europe.*
White, Capt. A. W. ... ... Poona.
White, Colin R. ... ... Mandapam.
White, C. R. ... ... Shwebo, Burma.
White, Chas. W. ... ... Bombay.
White, C. A. ... ... Alipore.
White, W. T. ... ... Rangoon.
White, W. P. ... ... Bhandara, C. P.
Whitehead, Capt. C. H. T. ... . Kohat.
Whitehead, John (I.F.S.) ... ... *Europe.*
Whitehead, Major J. H. ... ... Port Blair.
Whitehead, T. A. ... ... Cuddapah.
Whittall, Lieut. G. ... ... Malapuram.
Whittall, Brigade-Col. F. V. ... ... *Europe.*
Whitworth, G. C. (*Life Member*) ... ... *Europe.*
Whymper, S. L. ... ... *Europe.*
Wickham, H. C. ... ... *Europe.*
Wickham, P. F. (C.E.) ... ... Rangoon.
Wiles, G. (I.C.S.) ... ... Belgaum.
Wilkis, J. S. ... ... Russelkonda.
Williams, E. Alban... ... ... Bombay.
Williams, Major C. E. (I.M.S.) ... ... *Europe.*
Williams, J. K. ... ... Bijapur.
Williamson, A. (I.C.S.) ... ... Shwegyin.
Williamson, K. B. ... ... Jubbulpore, C. P.
Williamson, W. J. F. ... ... Bangkok, Siam.
Willis, R. A. ... ... Bombay.
Willock, Comdr. A. R. G. (R.I.M.) ... ... Akyab.
Wilson, Major Alban ... ... Shillong, Assam.
Wilson, A. R. ... ... Almora, U. P.
Wilson, P. R. ... ... *Europe.*
Wilson, A. T. ... ... Bushire.
Wilson, Johnstone J. (I.C.S.)... ... ... *Europe.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Wilson, C. C.	... Coimbatore.
Wilson, Lt.-Col. C. H. L. F. (R.A.) ...	... *Europe.*
Wilson, H. C.	... Madras.
Wilson, J. C. C.	... Papun, Burma.
Wilson, P. N. W.	... Jubulpore.
Wilson, R. A. (I.C.S.)	... Jubbulpore.
Wilson, William Burns	... *Europe.*
Wimbush, O. C. B....	... *Europe.*
Wimbush, A.	... Nilambar, Malabar.
Winter, G. B. (A.M.I.C.E.)	... Bombay.
Withinshaw, L.	... Ramnad.
Withers, D. S.	... Assam.
Witt, D. O. (I.F.S.)	... Saugor, C. P.
Wood, C. W. (C.E.)	... Madras.
Wood, Major H. (R. E.)	... Bombay.
Wood, Major H. S. (I.M.S.)	... Calcutta.
Wood, John A.	... Kelantan.
Wood, S. C. G.	... Bombay.
Woodhouse, E. J.	... Sabour.
Worgan, Capt. R. B.	... Madras.
Wright, A. J.	... Travancore.
Wright, Lt-Col. E. H. (I.M.S.) ...	... Tanjore.
Wright, F. A. (C.E.)	... *Europe.*
Wright, H. C.	... *Europe.*
Wright, J. M. (I.C.S.)	... Shwebo, Burma.
Wright, Capt. W. D. (I.M.S.)... ...	... Belgaum.
Wroughton, R. C. (F.Z.S.) (*Life Member*)	... Natal, S. Africa.
Wyndham, P. (I.C.S.)	... Mirzapur.
Yates, R. C. C.	... Madras.
Yeo, Edwin W.	... Bombay.
Yerbury, Col. J. W. (R.A.) (*Life Member*)	... *Europe.*
Younan, Lt.-Col. A. C. (I.M.S.) ...	... China.
Young, E. H.	... *Europe.*
Young, F. B.	... *Europe.*
Young, H. G.	... Lahore Cantt.
Young, J. V. (I.F.S.)	... Pyinmana, Burma.
Young, Capt. M. J. D.	... Rawalpindi.
Yule, Capt. R. A.	... *Europe.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January 1911 to 31st December 1911

RECEIPTS.	Rs. a. p.	Rs. a. p.
BALANCE ON 31ST DECEMBER 1910—		
Cash in the National Bank of India, Ltd...	2,729 13 0	
Cash on hand	145 5 0	
Balance per Petty Cash Book..	38 14 2	
" " Postage Book	46 10 9	
	1,960 10 11	
Less—Cheque drawn in December 1910 but cash in January 1911	125 0 0	2,835 10 11
Subscription for 1908 (in arrears)	15 0 0	
" 1909 "	120 0 0	
" 1910 "	331 2 0	
" 1911	18,240 9 9	
" 1912 (in advance)	2,464 3 6	
" 1913 "	15 13 6	
" for Life Membership	600 0 0	21,786 12 9
Entrance Fee	1,620 12 0	
Government of Bombay Grant-in-aid	5,000 0 0	
Sundries	372 3 0	
Sale of Journals	1,472 12 6	
Sale of Duck Book	248 2 6	
Interest on Investments	1,607 2 2	
Interest allowed by the Bank :	89 4 6	10,410 4 8
Total Rs. ..		35,032 12 4

EXPENDITURE.	Rs. a. p.	Rs. a. p.
Journal Account	12,698 6 10	
Salaries of the staff	9,014 10 2	
Rent of the Rooms	2,640 0 0	
General Charges	3,937 14 1	
Postages	743 0 3	
Printing and Stationery	563 1 8	
Library	302 0 9	
Furniture	963 4 8	
Sundries	564 11 2	
Bank charges	65 5 0	31,492 6 7
By Balance—		
Cash in the National Bank of India, Ltd. ..	2,194 9 9	
Cash with the Honorary Treasurer	980 14 0	
Cash on hand	316 13 6	
Balance per Petty Cash Book	43 4 6	
" Postage Book	4 12 0	3,540 5 9
Securities—	Nominal Value.	
3½ % Government of India Pro. Notes ..	14,000 0 0	
4 % Bombay Port Trust Unguaranteed Bonds.	14,000 0 0	
4 % City of Bombay Improv. Trust Bonds ..	15,000 0 0	
	43,000 0 0	
Total Rs. ..		35,032 12 4

We have seen a letter from the National Bank of India, Limited, to the effect that the above Securities were held on the Society's behalf on the 31st December 1911.

Examined and found correct.

(Sd.) L. H. SAVILE,
Honorary Treasurer.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants and Auditors.

BOMBAY, *29th May* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January 1912 to 31st December 1912.

RECEIPTS.	Rs. a. p.	Rs. a. p
To BALANCE ON 31ST DECEMBER 1911—		
Cash with The National Bank of India ..	2,194 9 9	
" " Honorary Treasurer	980 14 0	
" " on hand	316 13 6	
Balance per Petty Cash Book..	43 4 6	
" " Postage Book	4 12 0	
		3,540 5 9
Subscription for 1909 (in arrears)	30 0 0	
" " 1910 (")	360 0 0	
" " 1911 (")	905 15 9	
" " 1912	19,966 13 1	
" " 1913 in advance	2,564 7 9	
" " 1914 "	16 0 0	
" Life Memberships	1,000 0 0	
	24,843 4 7	
Less—Refunded	60 4 0	
		24,783 0 7
Entrance Fee	1,950 0 0	
Government of Bombay Grant-in-aid ..	5,000 0 0	
Sundries	784 12 11	
Library	44 10 0	
Sale of Snake Books	187 8 0	
" " Journals	2,561 3 2	
Interest on Investments	1,607 2 2	
" allowed by Bank	101 5 11	
		12,236 10 2
Total Rs. ..		40,560 0 6

EXPENDITURE.	Rs. a. p.	Rs. a.
By Journal Account	19,537 6 4	
Salaries	9,616 0 6	
Rent of Room	2,860 0 0	
General Charges	2,149 3 0	
Postage..	983 1 6	
Printing and Stationery	669 9 6	
Library	318 11 10	
Furniture	416 11 0	
Sundries	748 9 10	
Bank Charges	65 5 0	
Insurance	75 0 0	
		37,439 10 6
By Balance—		
Cash with The National Bank of India, Ld ..	2,214 3 6	
Cash on hand..	847 8 5	
Balance per Postage Book	48 2 9	
Balance per Petty Cash Book	10 7 4	
		3,120 6 0
By Securities—	*Nominal Value.*	
3½ % Government of India Pro. Notes ..	14,000 0 0	
4 % Bombay Port Trust Unguaranteed Bonds	14,000 0 0	
4 % City of Bombay Improvement Trust Bonds	15,000 0 0	
Total Rs. ..	43,000 0 0	30,560 0 6

We have seen a letter from the National Bank of India, Limited, to the effect that the above Securities were held on the Society's behalf on the 31st December 1912.

Examined and found correct.

(Sd.) L. H. SAVILE,
Honorary Treasurer.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants and Auditors.

BOMBAY, 10*th March* 1913.

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BOMBAY NATURAL HISTORY SOCIETY.

MAMMAL FUND.

STATEMENT of ACCOUNTS from 1st January 1911 to 31st December 1911.

RECEIPTS.	Rs. a. p	Rs. a. p.
Donations received during the year	23,394 12 7	
Interest from the Bank	129 7 2	
,, on Fixed Deposit	75 13 3	
		23,600 1 0
Rs. ..		23,600 1 0

EXPENDITURE.	Rs. a. p.	Rs. a. p.
Collecting Expenses:—		
Mr. Crump's Salary	1,800 0 0	
,, ,, Travelling Expenses	847 6 6	
,, Shortridge's Salary	298 13 3	
,, ,, Passage and incidental Charges	867 10 11	
Ammunition, Collecting Boxes and Railway Charges, &c.	717 13 6	
Camp Kit	951 6 2	
	5,483 2 4	
Less—Amount recovered from Mr. Crump towards the cost of Gun	120 0 0	5,363 2 4
Printing and Stationery	....	526 6 8
General Charges	....	409 4 9
Postages	....	210 11 0
Balance—		
Fixed Deposit with the National Bank of India, Limited	10,070 0 0	
Cash in the National Bank of India, Limited.	5,743 2 0	
Advance to Mr. Shortridge for travelling expenses (to be accounted for)	922 6 0	
Advance to Mr. Crump, for travelling expenses (to be accounted for)	322 4 3	
Balance per Petty Cash Book	19 8 6	
,, ,, Postage Book	13 2 6	
		17,090 8
Rs. ..		23,600 1 0

(Sd.) L. H. SAVILE,
Honorary Treasurer.

Examined and correct.
(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants and Auditors.

BOMBAY, 29th *May* 1912.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

BOMBAY NATURAL HISTORY SOCIETY.

MAMAL FUND.

STATEMENT of ACCOUNTS from 1st January 1912 to 31st December 1912.

RECEIPTS.	Rs. a. p.	Rs a. p.
BALANCE AT 31ST DECEMBER 1911,—		
Fixed Deposit with the National Bank of India, Ltd.	10,070 0 0	
Cash in the National Bank of India, Ltd...	5,743 2 0	
Advance to Mr. Shortridge	922 6 0	
Advance to Mr. Crump	322 4 6	
Balance per Petty Cash Book	19 8 6	
Balance per Postage Book	13 3 6	
		17,090 8 3
Donations received during the current year ..	11,541 0 2	
Interest on Fixed Deposit	328 2 4	
" " Current Account	115 0 10	
Sundries	28 14 4	
Cost of Gun recovered	80 0 0	
		12,093 1 8
Total Rs. ..		29,183 9 11

EXPENDITURE.	Rs. a. p.	Rs. a. p.
COLLECTING EXPENSES.—		
Mr. Crump's Salary	2,400 0 0	
" " Allowance (while in Bombay)..	152 14 5	
" " Travelling and Camp Expenses.	1,219 4 6	
Mr. Shortridge's Salary	3,900 0 0	
" " Allowance	455 0 0	
" " Travelling & Camp Expenses.	2,122 7 11	
" " Kit	63 11 0	
Salaries and Expenses of the Staff	966 0 9	
Ammunition collecting boxes and collecting charges	1,045 1 0	
Camp kit	102 12 0	
		12,427 3 7
Printing and Stationery	45 6 9	
General Charges	580 9 3	
Camera purchased	219 12 0	
Postage	101 11 9	
Sundry Expenses	291 6 2	
		1,238 13 11
By Balance—		
Fixed Deposit with the National Bank of India, Ltd.	10,380 0 0	
Cash in the National Bank of India, Ltd. ..	4,333 13 3	
Advance to Mr. Shortridge (to be accounted for)	475 0 0	
Advance to Mr. Crump (to be accounted for)..	300 0 0	
Balance per Postage Book	12 11 9	
Balance per Petty Cash Book	15 15 5	
		15,517 8 5
Total Rs ..		29,183 9 11

Examined and found correct.

(Sd.) L. H. SAVILE,
Honorary Treasurer.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants and Auditors.

BOMBAY, 10*th March* 1913.

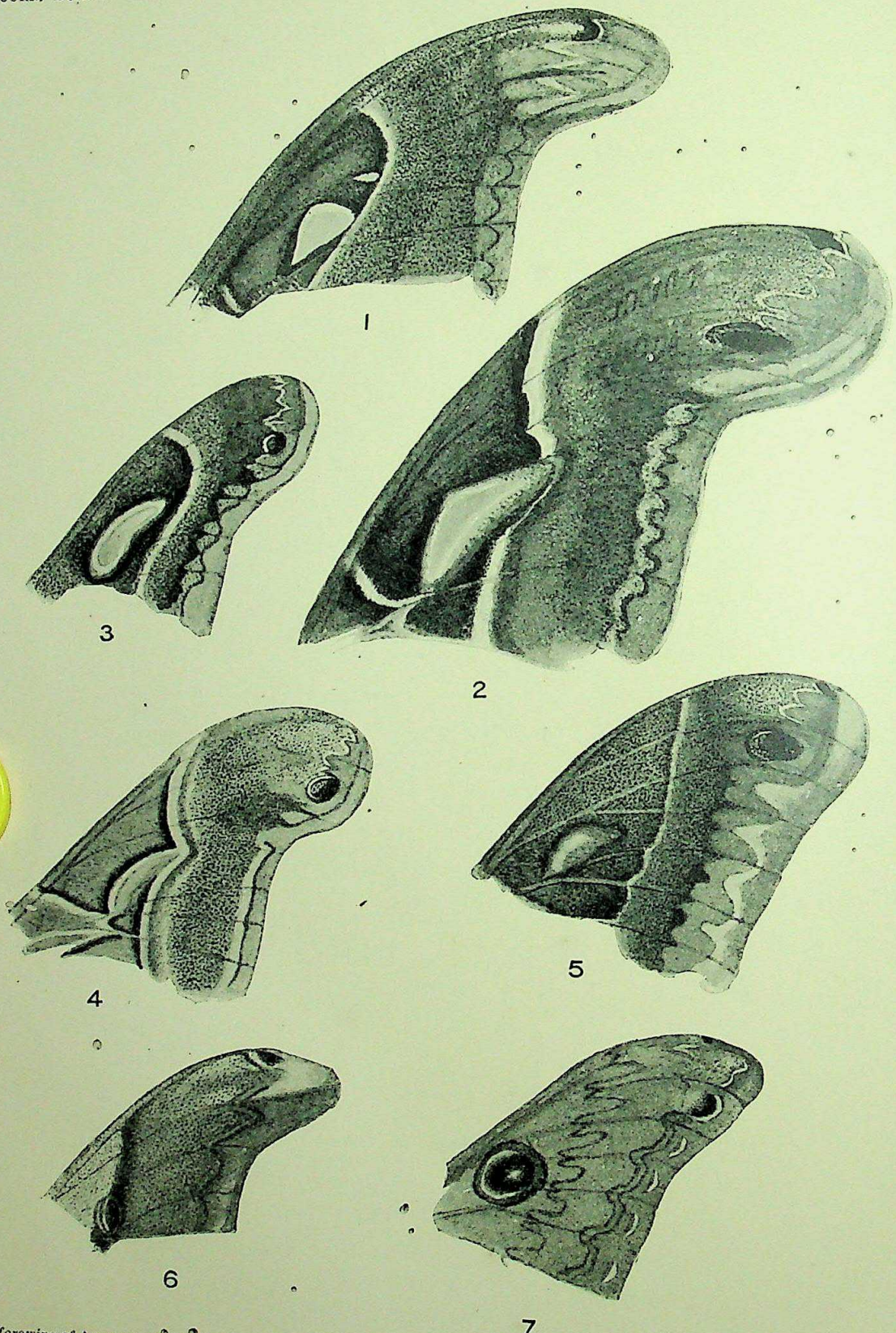
Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Apex of forewing of ATTACUS ATLAS (*Linn*), from India.
Apex of forewing of ATTACUS EDWARDSI (*White*), from India.
Apex of forewing of ATTACUS MITHYMNA (*Westwood*), from Natal.
FIG. 7. Apex of forewing of LOEPA KATINKA (*Westwood*), from Sumatra.

FIG. 4. Apex of forewing of ATTACUS CYNTHIA (*Drury*), from India.
" 5. Apex of forewing of SAMIA CECROPIA (*Linn*), from United States.
" 6. Apex of forewing of SATURNIA SIMLA (*Westwood*), from India.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MIMICRY IN SILK-WORM MOTHS.

(With Plates I, II and III).

The phenomenon of Mimicry, as presented by Lepidoptera, affords a most fascinating study to those who go about the world with their eyes open—even though they may not happen to be students of entomology. For instance, what beginner at collecting has not been struck by the startling resemblance of the female of *Hypolimnas misippus* (Linn.), to the common *Danais chrysippus* (Linn.)? or by that of the moth *Epicopia rolydora* (Westw.) to the Papilios of the *Philoxenus* group ?—just to mention two very self-evident instances. What is the meaning of it? and why should *D. chrysippus* be such an exceedingly common butterfly? are questions which suggest themselves to us at once. These are phenomena which are presented to us, and it is "up to" us to endeavour to account for them in some reasonable manner, and not to pass the problems by as insoluble. In endeavouring to account for them, however, one fundamental rule must not be lost sight of, which is that the imitator and it's model must be or must recently have been inhabitants of the same locality, otherwise the whole theory of mimicry falls to the ground. As it happens, the solution of the apparent enigma referred to above is a simple one: the sub-family *Danainæ* to which *D. chrysippus* belongs have, as we all know, acquired the faculty of being distasteful to the many insectivorous birds and reptiles which prey upon, butterflies and moths, and so enjoy immunity from their attacks, and are consequently, numerous in individuals; and further, some of those forms, which do not possess this faculty, have gradually become developed in imitation of their more fortunate comrades, in accordance with the Darwinian Law of the survival of the fittest. The immunity of these specialized forms has probably been acquired as follows:—the larvæ of many of them are known to feed on *Aristolochia indica*, *Gomphocarpus fruticosus* and other Asclepiad plants which, when cut, exude a white milky substance which is exceedingly bitter to the taste, and the inference is that this quality is transmitted to the imagines and renders them distasteful. The *Philoxenus* group of *Papilio* is also protected by possessing, as imagines, a disgustingly rank odour, somewhat resembling musk, which is so strong and enduring that it remains even after the death of the insect.

Still the theory of protective imitation is a thorny subject to tackle, and it is with considerable diffidence that I write this paper dealing with another forms of mimicry as exemplified by forms of the family *Saturniidæ* (or silkworm moths). Any observer who has studied the family must have been struck by the faithful representation of a snake's head, which appears on both sides of the apex of the forewing in the various forms of the genus *Attacus* and other allied genera of *Saturniiadæ*; in other words, the apex of the forewing of these forms appears to have been developed in imitation of the head of some snake: this phenomenon is apparent at once to anyone who places a piece of paper over a specimen in the cabinet, so as to cover up the whole insect from view except the apical half of the forewing.

I have figured the apices of the forewing of seven forms of *Saturniiadæ* in my collection, which exhibit this character with greater or less fidelity, the two most striking representations being undoubtedly *Attacus atlas* and *Attacus edwardsi*, the former of which exhibits the snake's head in profile and the latter gives a view of the head from above, showing both eyes: the remaining forms though, perhaps, not so striking, give, nevertheless, an accurate delineation of a serpent's head, and point to general tendency towards snake mimicry in this family in forms from the Æthiopian and Nearctic regions as well as the Oriental.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

It may be objected that the colours of these moths are very different from those of the cobra and other snakes, but allowance should be made for the moths resting under the shade of leaves, as they would often be, during the sunny hours of the day, when the colours would not show up so brightly. In such circumstances, well marked colouration would be necessary to bring out the details when in deep shadow, and even the apex of the forewing of such a brightly coloured moth as *Loepa katinka* (Westw.) might be mistaken for the head of one of the smaller bright green snakes. In any case, the phenomenon is a most remarkable one, and I have not read as yet of any reasonable explanation of it; that there is a reason for it is as great a certainty as that there is a reason for the existence of everything in nature, in the economy of which all forms of life work out their allotted duties. Let us try, then, to see how we may reasonably account for it.

Being of large size, these moths are conspicuous objects, when resting, and some protection is necessary for the continuation of the species. There are in India 213 species of snakes of which some 33 are poisonous: the food of many of them consists of rats, mice and small birds,—a percentage of which are insectivorous: the toll of birds taken by these reptiles must be very considerable, and is said to be obtained by the exercise of a mysterious power termed 'fascination,' the victim being held, as it were, by the gaze of it's destroyer, and compelled to remain in the same spot until the serpent can approach sufficiently near to seize it. It is clear, therefore, that an insectivorous bird in pursuit of a moth amongst the leaves of a tree would be quickly brought to a standstill by the appearance of a snake's head just as it was about to seize it's prey.

Now an Atlas moth resting amongst the leaves of a tree (as shown in Plate No. I.), with the apices of the forewing projecting and giving the appearance of a snake's head, would, in my opinion, have a good chance of escape from any insectivorous bird, which suddenly came across it; and as the upper and underside of the wings representing the reptile are coloured in a similar manner, the result would be the same on whichever side it was approached.

Such appears to me to be the most likely explanation of the phenomenon. Some remarks in detail on the forms figured may now be given.

Fig. 1.—*Attacus atlas* Linn—In this form a side view or profile of the snake's head is seen. The eye is represented by the black subapical spot, and the mouth by the crimson streak below it, while the dark markings with whitish edges and diaphanous spot in the centre of the wing would serve to represent the "hood" and "spectacles" of a cobra.

Fig. 2.—*Attacus edwardsi* White.—This form gives the most startling and sinister representation of a Serpent's head of any of the forms figured. The aspect presented is that which would appear to an observer looking down on it from above; the violet subapical patch would represent the shining surface of the top of the snake's head; the small black subcostal apical spot is the left eye, and the somewhat elongated oval black spot between veins 6 and 7 the right eye, while the mouth and lips are shown by the submarginal and marginal lines; as in fig. 1 the central markings serve to represent the "hood" and "spectacles."

Fig. 3.—*Attacus mithymna* (Westw).—An African form representing a smaller species of snake viewed from above; the various details are well brought out in this form: central markings present, and give a fair representation of "hood" and "spectacles" of *Naja haje*, the African cobra.

Fig. 4.—*Attacus cynthia*, (Drury)—A form very similar to the last, but much lighter in colouration; snake's eye and mouth well delineated. This

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sketch of ATTACUS ATLAS resting on the branch of a tree, showing the protection obtained by the apices of forewings resembling serpents' heads.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

form is curious in that, while the outlines indicate unmistakably a snake's head, the colouration does not appear to have been modified to an equal extent. Inhabits the Nearctic as well as the Oriental region.

Fig. 5.—*Samia cecropia* (Linn.).—An American form showing a similar aspect of a snake's head to the two last; both eyes are represented.

Fig. 6.—*Saturnia simla* (Westw.).—This form represents the snake's head as it would appear to an observer somewhat below it. Subcostal black spot representing eye, and pale subapical patch showing part of the snake's head above the line of the mouth. An interesting form as the hind wings appear to be somewhat modified, to represent an owl's head in certain positions. (Plate No. II).

Fig. 7.—*Loepa katinka* (Westw.).—This form is interesting in that it shows a marked tendency to snake imitation, even in a form in which the specific colouration does not lend itself to mimicry of this kind. Yet here we have the usual violet subapical patch referred to above, with a more or less developed black spot between veins 6 and 7, and the other eye indicated by a minute subapical costal spot.

It is somewhat difficult to imagine surroundings in which this form with its unusually vivid colouration could be mistaken for a snake, unless, when resting among similarly coloured leaves in deep shadow, it may resemble one of the smaller bright green snakes.

Another remarkable character in this family is the diaphanous spot in the centre of each wing: in the hindwing these are, in many forms, much enlarged and developed into conspicuous eye-like spots. These may be intended to afford protection by presenting the appearance of an owl's head when the moth is at rest amongst the leaves of a tree as suggested. (Plate No. II.). These spots are most beautifully developed in this direction on the hind wings of *Telea polyphemus*, Cramer, an American form. Of course, an owl's head would have an equally deterrent effect as that of a snake on a small insectivorous bird.

J. M. FAWCETT, Col.,
(late 5th Lancers).

England, 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NEW GENERIC TERMS PROPOSED IN THE PRESENT VOLUME (XXI.)

	Page.
Cremnomys (Mammalia)	340
Crusimetra (Insecta)	855
Elegistis (Insecta)	125
Hermenias (Insecta)	852
Lamyristis (Insecta)	131
Prytancutis (Insecta)	109
Synhamitermes (Insecta)	792
Thermopteryx (Insecta)	1254

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sketch of SATURNIA SIMLA (*Westw.*), resting amongst leaves, showing the protection obtained by the hindwings resembling the head of an owl. Note also, the serpent's head at the apices of the forewing.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Index of Illustrations.

	Pages.
Acmœa bombayana, Figs. ..	.. 638
Amarnath Valley, Fig. ..	..1312
Anaphœis, Fig.	..1132
——— *mesentina*, Pl. ..	..1145
Anytus lencocyma, Pl. ..	..1244
Apatura florenciæ Pl. ..	.. 48
Aphnœus ? Pl.	.. 590
Appias, Fig.	..1133
Arbela thewora, Pl.	..1244
Arenga wightii, Pl.	.. 355
Armillaria mellea, Pl. ..	..1273
Asiled, Ootheca of an, Pls. ..	610, 612
———, oviposition, Fig. ..	.. 697
Asterina, Fig.	..1279
Asura fulvimarginata, Pl. ..	..1244
——— *phantasma*, Pl. ..	..1244
——— *toxodes*, Pl.	..1244
Barwal, Pl., 1066 ; Fig. ..	..1067
Bat, Painted, Pl.	..1181
Belteram range, Cutch, Figs.	709, 710, 712
Bengal Florican, Pl. ..	..1109
Bibos frontalis, Fig.	..1072
Bombay Presidency, Orchids of the Pl. XV	.. 171
Borassus flabellifer, Pls. 932, 934 ; Fig.	931, 1098
Bos sondaicus, Fig.	.. 657
Bostra mesalencalis, Pl. ..	..1244
Bubulcus coromandus, Fig. ..	.. 276
Budorcas taxicolor, Pl. ..	1069, 1070
Buffalo, Central Provinces, Fig.	..1346
Bustard, Great Indian, Pl.	303
Butterflies, Common, of the Plains of India, Pls. D2-D4, I. J. ..	518, 522, 528, 1145, 1153 ;
———, Naga Hill, Pls. A-B.	48, 590
Cabbage Palmetto, Pl.	382
Calotes jerdoni, Fig	692
Canis aureus, Fig.	838
Capra falconeri, Fig.	617
Castor Rust. Pls.	1092, 1094
Cat, Jungle, Fig.	..1183
Catopsilia, Fig.	..1133
——— *pyranthe*, Pl. ..	..1153
Calama dentilinea, Pl. ..	..1244
——— *lencoscopula*, Pl. ..	..1244
——— *mesotherma*, Pl. ..	..1244
——— *rufimixta*, Pl. ..	..1244
Cerceris agnata, Pls. ..	.. 488
——— *baluchistanensis*, Pls.	.. 818
——— *binghami*, Pls. ..	.. 488
——— *boysi*, Pls.	.. 418
——— *circumcincta*, Pls. ..	.. 818
——— *comberi*, Pls. ..	.. 818
——— *compta*, Pls. ..	.. 818
——— *elizabethæ*, Pls. ..	.. 818
——— *ephippuim*, Pls. ..	.. 488
——— *fastidiosa*, Pl. ..	.. 818
——— *ferocior*, Pls. ..	.. 818
——— *ferox*, Pls.	.. 818
——— *flavopicta*, Pls. ..	.. 488
——— *flavoplagiata*, Pls. ..	.. 488
——— *fortinata*, Pls. ..	.. 818
——— *funera pallidopicta*, Pls.	.. 488
——— *hilaris*, Pls. ..	488, 818
——— *humbertiana viscosus*, Pls.	.. 488
——— *inexorabilis*, Pls. ..	488, 818
——— *instabilis*, Pls. ..	.. 818
——— *invita*, Pls.	.. 818
——— *kirbyi*, Pls.	.. 488
——— *latibalteata*, Pls. ..	.. 488
——— *lencozonica*, Pls. ..	.. 488
——— *mastogaster*, Pls. ..	.. 818
——— *melaina*, Pls. ..	.. 818
——— *nebulosa*, Pls. ..	.. 488
——— *novaræ*, Pls. ..	.. 818
——— *nursei*, Pls.	.. 818
——— *orientalis*, Pls. ..	.. 488
——— *pruinosa*, Pls. ..	.. 488
——— *pulchella*, Pls. ..	.. 488
——— *quettaensis*, Pls. ..	.. 488
——— *rhyncophora*, ..	.. 818
——— *rothneyi*, Pls. ..	.. 488
——— *saussurei chrysothemis*, Pls.	.. 488
——— *tetradonta*, Pls. ..	.. 488
——— *ristis*, Pls.	.. 818
——— *vigilans*, Pls. ..	.. 488

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGES.

Cerseris violaceipennis, Pls... .. 818
——— *vischnu*, Pls. 818
——— *wroughtoni*, Pls. 488
Cervulus aureus, Fig. 1068
Cervus eldii, Fig. 654
Charwar Hills, Figs. 1347, 1348
Chilo arœalis, Pl. 1244
Chinese Levistona, Pls. 346, 355, 388
Chloroclystis dentatissima, Pl. ..1244
——— *plicata*, Pl. 1244
——— *polygraphata*, Pl. ..1244
Cidaria nyctichroa, Pl. 1244
Clavaria cinerea, Pl. 1299
Colias, Fig. 1132
Colotis, Fig. 1132
——— *amata*, Pl. 1153
——— *etrida*, Pl. 1153
Commerson's Latania, Pl. 925, Fig. . 926
Corypha talliera, Fig. 71
——— *umbraculifera*, Pls. 66, 68, 70 Fig. 67, 68
Crambus albiceps, Pl. 1244
———*endopolia*, Pl. 1244
———*neurigrammalis*, Pl. ..1244
Cremnomys cutchicus, Pl. 338 ; Fig.. 341
Cutch, Map of, Fig. 640
Cyllogeres janetœ, Pl. 48
Delias eucharis, Pl. 1145
Diagram of the Belteram range,
———Cutch, Fig... .. 709, 710
——— of the Charwar Hills Figs. 1347, 1348
——— of ridges of clay left by Voles. Fig. ..1322
Dichonia chlorate, Pl. 1244
Dwarf Sabal, Pl. 380
Egyptian Doum Palm, Pl. 922
Epiplema fulvihamata, Pl. 1244
Episilia arenacea, Pl. 1244
——— *clavata*, Pl. 1244
Erinaceus collaris, Fig. 833
——— *micropus*, Fig. 834
Eryx conicus, Pl. p. 1 ; Fig... .. 11
——— map showing distribution of 10
——— *johni*, Pl. 1
——— map showing distribution of 18
Eupodotis edwardsi, Pl. 303

PAGES.

Favolus ciliaris, Pl. 1273
Felis affinis, Fig. 1183
Flata, Pls. 607, 608
Florican, Bengal, Pl. 1109
——— Lesser, Pls. 721, 730, 736
Fomes homodermus, Pl. 1285
Fox, Indian, Fig. 1185
Fungi, Indian, Pl. 147
——— of India, Pls. I—IV, 1273, 1279, 1285, 1299

Gadag, Result of ten days' collecting at, Pl... 642
Game Birds of India, Burma and Ceylon, Pls. V-VIII & A, B..303, 324, 330, 721, 730, 736, 1109
Ganoderma formosissimum, Pl. ..1279
Gayal, Fig. 1072
Geaster saccatus, Fig.. 1278
Geisha distinctissima, Pl. 607
Great Indian Bustard, Pl. 303
Grypomys gleadowi, Pl., 338 ; Fig... 341
Gymnoscelis lobata, Pl. 1244

Habenaria susannæ, Pl. 171
Halone flavinigra, Pl. 1244
Hardwicke's Hedgehog, Fig. .. 833
Hebomoia australis, Pl. 1153
Hedgehog, Hardwicke's, Fig. .. 833
———, Northern pale, Fig. .. 834
Helicops schistosus, Pl. 1016
——— ———, Map showing distribution of 1020
Heterographis augentescens, Pl. ..1244
Hexagona pobeguini, Pl. 1285
Himalayan Snow Cock, Fig. ..1084
Hoogendorps Livistona, Pl. .. 356
Houbara, Pls. 324, 330
Houbara macqueeni, Pls. .. 324, 330
Howea forsteriana, Pl. 355
Hunia, Pl. 1066
Huphina nerissa, Pl.. 1145
Hydnum, Pl. 1299
Hyphæne indica, Pls., 917, 918 ; Fig. 918
——— *thebaica*, Pl. 922
Hypsirhina enhydris, Pl., 1016; Figs.1018
——— ———, Map showing distribution of 1020
Ilema atrifrons, Pl. 1244
Ilerda kohimensis, Pl. 590

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGES.

Ilerda viridipunctata kala, Pl. .. 590
Indian Doum Palm, Pls., 917, 918 ; Fig. 918
——— Fox, Fig. 1185
——— Python, Pl. 448
Ixias marianne, Pl... 1145
—— *pyrene*, Pl. 1153

Jackal, Persian Gulf, Fig. 838
John's Earth Snake, Pl. 1
———, Map showing distribution of 18
Jungle Cat, Fig. 1183

Kagi, Pl. 1066
Keelback, Olivaceous, Pl., 1016 ; Fig... 1018
———, Map showing distribution of 1020
Kerivoula picta, Pl. 1181

Lampides elpis chinee, Pl. 590
Latania commersonii, Pl., p. 925 ; Fig... 926
———*loddigesii*, Pl., 926 ; Fig. .. 928
Leggada platythrix, Fig. 773
Lenzites ochroleuca, Pls. .. 147, 1299
Lepidogma chlorophilalis, Pl. ..1244
Leptosia, Fig. 1131
———*xyphia*, Pl... 1145
Lesser Florican, Pls. ..721, 730, 736
Lethe brisandra, Pl. 48
—— *dinarbas*, Pl. 48
Licuala elegans, Pl. 84
——— *grandis*, Pl., 86 ; Fig. .. 86
——— *peltata*, Pl., 80 ; Fig. .. 79
——— *spinosa*, Pl., 588 ; Fig. .. 82
Liku, Pls. 721, 730, 736
Lioptila capistrata, Figs. 254
Livistona sp., Pl. 355
——— *chinensis*, Pls. 346, 355, 388
——— *hoogendorpii*, Pl. 356
——— *inermis*, Pl... 355
——— *olivæformis*, Pl. 355
Loddiges' Latania, Pl., 926 ; Fig... 928
Lophiostigma xerophilum, Fig. ..1280
Lycodon fasciatus, Fig. 1336
Lycophotia poliades, Pl. 1244

Macalla eumictalis, Pl. 1244
Mammal Survey of India, Pl. A. ..1181

PAGES.

Map of Belteram range, Cutch, Fig. 712
——of Cutch, Fig. 640
——showing distribution of *Eryx conicus* 10
——— *Eryx johni* 18
——— *Helicops schistosus* 1020
——— *Hypsirhina enhyaris* 1020
Marasmius subrhodocephalus, Pl. ..1273
Massepha rufescens, Pl. 1244
Mazari Palm, Pls. pp. 72, 76 ; Fig.. 74
Melampsorella ricini, Pls. .. 1092, 1094
Melissoblaptes monochroa, Pl. ..1244
Microcerotermes heimi, Pl. 790
Microtus, Fig. 1322
Millardia meltada, Pl. 338
Mithan, Fig. 1072
Moths of India, Pl. G. 1244
Mus manei, Fig. 773
—— *phillipsi*, Fig. 773
Musa superba, Fig. 706

Naga Hill Butterflies, Pls. A-B. 48, 590
Nannorhops ritchieana, Pls., 72, 76 ; Fig. 74
Neasura taprobana, Pl. 1244
Neomelicharia furtiva, Pls... 607, 608
Nephopteryx rhodobasalis, Pl. ..1244
Northern pale Hedgehog, Fig. .. 834

Odontotermes brunneus, Pl... .. 790
——— *obesus*, Pls. 778, 780, 782
Oligostigma andreusialis, Pl. ..1244
Olivaceous Keelback, Pl., 1016 ; Figs. ..1018
——— Map showing distribution of 1020
Oorial, Fig. 1065
Oraniella coffeicola, Fig. 1280
Orchids of the Bombay Presidency, Pl. XV 171
Oreodoxa regia, Pl. 355
Ovis vignei cycloceros, Fig. 1065

Painted Bat, Pl. 1181
Palmetto Royal, Pl. 382
Palms of British India, Pls. XVIII—XXXIX, 66, 68, 70, 72, 76, 80, 84, 86, 346, 355, 356, 358, 380, 382, 388, 917, 918, 922, 925, 926, 932, 934.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGES.

Palmyra Palm, Pls., 932, 934; Fig. 931, 1098
Papilio doson, Figs. 758
——— *helenus daksha*, Pl. 518
——— *polymnestor*, Pl. 522
——— *polytes cyrus*, Pl. 528
——— ——— *polytes*, Pl. 528
——— ——— *romulus*, Pl. 528
——— *teredon*, Figs. 762
Pereronia hippia, Pl. 1145
Persian Gulf Jackal, Fig. 838
Phengaris atroguttata, Pl. 590
Pheretima posthuma, Figs. .. 290, 291
Phyrulla aurantiaca, site of nest of, Fig. 1308
Pieris, Fig. 1133
Polystictus umbilicatus, Pl. 147
——— *xanthops*, Pl. 147
Poronia oedipus, Fig. 1280
Prasinoxena metaleuca, Pl. 1244
Prioneris, Fig. 1132
Pritchardia pacifica, Pl. 358
Promachus, sp., Pls... .. 610, 612
Prorophora dialeuca, Pl. 1244
Psammophis schokari, Figs... .. 635
——— *triticeus*, Figs... .. 635
Pyromys priestleyi, Pl. 338
Python molurus, Pl... 448

Rœselia pallidiceps, Pl. 1244
Russell's Earth Snake, Pl., 1; Fig... 11
——— Map showing distribution of 10
Russula theissenii, Pl. 1273

Sabal adansoni, Pl. 380
——— *mauritiœformis*, Pl. 388
——— *palmetto*, Pl. 382
Salurnis marginellus, Pls. .. 607, 608
Sarcosoma mœlleri, Fig. 1279
Savannah Palm, Pl... 388
Schneider's Water Snake, Pl. ..1016
——— Map showing distribution of 1020
Section of a gill of an Agaric, Fig...1274
——— of the hymenium of an Ascomyces, Fig. 1275
——— of a pore of a Polyporus, Fig.1274
Sheep, Typical breeds of Nepal, Pl. p. 1066; Fig. 1067

PAGES.

Snakes, Common, Indian, Pls. XVI—XVIII 1,448, 1016
Snake, John's Earth, Pl. 1
——— Map showing distribution of 18
Snake, Russell's Earth, Pl. 1, Fig... 11
——— Map showing distribution of .. 10
——— Schneider's Water, Pl. ..1016
——— Map showing distribution of ..1020
Snow Cock, Himalayan, Fig. ..1084
Sonemurg—A bit of Woodland, Fig. 549
——— Glaciers, Fig. 551
Spatulipalpia albistrialis, Pl. ..1244
Spiny Licuala, Pl. 388
Sypheotis aurita, Pls... 721, 730, 736

Takin, Heads of, Pls... .. 1069, 1070
Talipot Palm, Pls. .. ..66, 68, 70; Figs. 67, 68
Termites from British India, Pls. A-D. 778, 780, 782, 790
Tetrogallus himalayensis, Fig. ..1084
Thermopteryx rubrifusa, Pl. ..1244
Tichestra serrata, Pl... 1244
Trachischium quinquelabialis, Fig... 202
Trichophysetis umbrifusalis, Pl. ..1244
Typhlopidus porrectus, Fig... .. 278

Ufeus carnea, Pl. 1244
Una usta, Pl... 590
Unicorn sheep, Fig... 1067
Utetheisa pulchelloides, Pl. 1244

Vizella urvilleana, Fig. 1279
Vulpes bengalensis, Fig. 1185

Washingtonia filifera, Fig. 363
——— *gracilis*, Fig. 373
——— *robusta*, Fig. 368
——— *sonoræ*, Fig. 375
Wasps, Indian Fossorial, Pls. A-D., 488, 81

Xylaria, Fig... 1280

Zia extrocta, Pl. 1244

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

INDEX OF SPECIES.

	Number.
Abeia triflora	703
Abies webbiana	142, 705, 1306
Abisara abnormis	969
——— chela	65, 584
——— ocherius	969
——— angulata	969
——— bifasciata	969
——— kausambi	969
——— prunosa	969
——— fylla	65, 584
——— neophron	65, 584
Ablabes gilgiticus	201
Abraxas diversicolor	1245
Abrota confinis	574
——— ganga	574
——— jumna	574
——— mirus	574
Abutilon avicennæ	212
——— bidentatum	226
——— graveolens	211, 1023
——— indicum	226
Acacia sp.	1290
Acantholipes hypenoides	1229
Acanthopneuste	545
——— davisoni	626, 671
——— magnirostris	1201
——— nitidus	155
——— occipitalis	160
——— plumbeitarsus	671
——— viridanus	160, 617
Acanthostigma heterochœta	1297
Acanthostoma wattii	1285
Accentor rubeculoides	184
——— strophiatus	185
Accipiters nisus	1311
Acer cœsius	1290
——— oblongus	1289
Acerbas anthea	1003
——— tagiadoides	1003
Achalarus bifasciatus	997
——— casyapa	997
——— liliana	997
Achillea millefolium	704
Achyranthes aspera	705
Acmœa bombayana	638, 639
——— ——— ceylanica	639
——— parasitica	639
——— travancorica	637, 639
Acomys	772, 773
Aconitum heterophyllum	704
——— lycoctonum	704
Acontia bimacula	907
——— firina	886
——— pulla	417
——— turpis	444
Acrapex	901
——— atriceps	901, 902
——— brunnea	901
——— hamulifera	901
——— leucophlebia	901, 902
——— prisca	901, 902
——— roseotincta	901, 902
Acridotheres ginginianus	169
——— tristis	92, 165, 1165, 1203
Acrocephalus agricola	155, 1201
——— dumetorum	159
——— stentoreus	159, 1201
Acroclita belinda	858
——— cheradota	856
——— chlorissa	859
——— clivosa	855
——— corinthia	858
——— esmeralda	858
——— grypodes	856
——— multiplex	860
——— neæra	859
——— neavana	857
——— physalodes	855

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Acroclita scleropa 857
——— symbolias 857
——— thysanota 860
Acronicta 425
——— leporina 425
Acronycta 425
——— aceris 428
——— albiorbis 425
——— alnoides 426
——— bicolor 427, 428
——— diffusa 426
——— fasciata 425
——— gastridia 427, 428
——— indica 426
——— iria 427
——— leporina 425
——— maxima 427
——— nigrostriata 425
——— pruinosa 425, 426
——— rubiginosa 427, 428
——— rumicis 425, 426
——— salicis 426
——— turanica 426
Acrospermum parasiticum 1288
Actœa spicata 703
Actinodura radcliffei 256
——— ramsayi 256
——— ripponi 625
Actinor radians 1004
Acutipenna 901
——— acuminata 901
Adelura cœruleicephala.. 262
Adiantum cappillus veneris 620
Adolias cyanipardus 574
——— dirtea 574
——— ——— khasiana 574
——— mergui 574
Adonis œstivalis 703
Aecidia 1092
Aecidium habunguensis.. 1094
——— harvettæ 147
Ægialitis alexandrina 161
——— dubia .. 102, 168, 662, 1168, 1217
——— geoffroyi 1217
——— hiaticula 266, 663

NUMBER.

Ægialitis mongolica 183
Aegithaliscus manipurensis 622
Ægithina tiphia .. 90, 164, 1164, 1199
Ælurus fulgens 1359
Æmona amathusia 54, 571
——— lena 571
Aeromachus discreta 1002
——— dubius 1002
——— indistincta .. 1001, 1002
——— jhora 1002
——— kali.. .. .. 604, 1002
——— koruthaialos butteri ..1001
——— obsoleta 1002
——— pygmœa 1002
——— stigmata 604, 1002
Æsalon chicquera 99, 167
——— regulus 618
Æschynomene indica 705, 1046
Æsculus indica 705
Æthopyga cara 1207
——— ignicauda 631
Agama himalayana 132
——— tuberculata 132
Agarista ægoceroides.... 909
Agave 1299
——— rigida sisalana 1296
——— vera-cruz.. 1284
Agrimonia eupatorium 703, 1054
——— pilosa.. 1054
Agrotis exempta.. 433
——— infixa 432
Ailographium cœspitosum 1287
Ainsliæa aptera 703
Alangium decapetalum 1298
Alauda gulgula 94, 165, 1206
——— japonica 631
Alaudula raytal 94
Alboffia oreophila 1298
Alcedo ispida .. 96, 166, 661, 1166, 1209
Alcippe nepalensis 1199
——— phayrii 1199
Aletia erigida 893
Aleurina orientalis 1289
Allescherina boehmeriæ.. 1298
——— cajani 1298

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Allotinus drumila 953, 981
——— horsfieldii 981
——— multistrigatus 593, 981
——— nivalis 981
——— panormis 981
——— subviolaceus 981
——— taras 981
Alpesa 878
——— villicosta.. 878
Alseodaphne 759
——— semicarpifolia .. 536, 763
Alseonax latirostris 161, 1165
——— ruficaudus 546, 1305
Alysicarpus hamosus 210
——— monilifer 210
——— rugosus 210
Amaltheus schaumburgi 1351
Amathusia amythaon 54
——— (Amathusia) phidippus .. 571
——— (———) ———andamanensis.. 571
——— (Amathuxidia) amythaon .. 571
Amathyntis athyra 113
——— catharopa 116
——— nucleolata 113
——— oporina 113
Amaurornis akool 101, 168
——— phœnicurus.. 101, 168, 1215
Ambala albivenalis 1250
Amblypodia andersoni 990
——— anita 990
——— darana 990
——— arracana 990
——— erichsonii 990
——— narada 990
——— naradoides 990
——— taooana 990
Ammomanes phœnicura.. 94, 162, 1166
Amphicome arguta 705
Amphidrina 435
——— agratina 435
——— intaminata 435
Amphipyra agrotoides 893
Amphisphæria botulispora 152
——— edamensis 152

NUMBER.

Amphisphæria khandalensis .. 152, 1297
Ampittia camerta 1001
——— dioscoroides 1001
——— lynx 1001
——— maro 604, 1001
——— maroides 1001
——— palemonides 1001
Ampullaria 708
Amyna pulveria 888
Anadebis himachala 54
——— (Anadebis) himachala .. 570
——— (Zethera) diademoides .. 570
Anagallis arvensis 702
Ananassa sativa 1287
Anaphæis 1132, 1134, 1135, 1136, 1137, 1144, 1145
——— mesentina 975, 1135, 1143, 1153
——— ———taprobana .. 975
——— taprobana 1157
Anaphalis nubigena 703
Anas boscas 181
——— haringtoni 1088
——— pœcilorhyncha 169
——— haringtoni 1359
——— zonorhyncha 1086, 1088
Anastomus oscitans 102, 1090, 1168, 1219
Anceps 1349, 1352
Ancistrodon himalayanus 133, 142, 201, 280
Ancylis ancorata 862
——— carpalima 861
——— rostrifera 862
——— scatebrosa 861
Androlymnia 896
——— emarginata 896
Andropogon, sp. 1291, 1292
——— aciculatus 1294
——— assimilis 1291
——— contortus 1292
——— micranthus 1291
——— muricatus 1291
——— nardus 1292
——— schœnanthus 1292
Anemone polyanthes 705
——— rivularis 703
Anerastia castanealis 1251

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Angelice glauce 703, 1057
Anodontodes 435
——— rotunda 435
Anomis figlina 1217
Anona reticulata 766
——— squamosa 766
Anopheles 649
Anoplotermes (Speculitermes) cyclops.. 775
Anorthodes 435
——— tarda 435
Anorthura neglecta 545
——— nepalensis 1305
Anser cinereus 1103
——— ferus 158, 618
——— indicus 158, 181, 1088
——— rubrirostris 1088
Antha 435
——— grata 435
——— pretiosa 435
——— rotunda 435
Anthistiria 1291
Anthostoma carteri 1299
Anthostomella bambusæ 1296
——— pandani 1295
Anthothreptes malaccensis 1207
Anchracoceros albirostris 1210
Anthracophyllum nigritum 151
Anthremus fasciatus 1091
Anthriscus nemorosa 703, 1056
Anthropoides virgo .. 157, 181, 183, 1089
1168, 1216
Anthus campestris 156
——— maculatus 156, 552, 673, 1166
——— richardi 154, 156, 1206
——— rosaceus 1206, 1313
——— rufulus .. 94, 165, 630, 1166, 1206
——— similis 160
——— striolatus 156, 1166
——— trivialis 156, 552, 1313
Anticrates 131
Antidesma 1286
Antilope bennettii 410
——— bezoartica 410, 1193
——— cervicapra 247, 410, 1193, 1359
——— chickara 825

NUMBER.

Antilope hazenna 410
——— subquadricornutus 825
——— (Cervicapara) quadricornis .. 825
Antirrhinum orontium 703
Apamea capensis 886
——— minima 889
——— modestissima 888
Apatela 425
——— aceris 425
Apatura ambica 56
——— chevana 56
——— florenciæ 56
——— pallas 57
——— parisatis 56
——— parvata.. 57
——— sordida 56
——— ulupi 56
——— (Apatura) ambica 573
——— (———) ——chitralensis 558, 573
——— (———) bhavana 573
——— (———) ilia here 573
——— (Chitoria) sordida 573
——— (Dravira) fulva 573
——— (———) pallas florenciæ .. 573
——— (———) ulupi 573
——— (Eulaceura) osteria 573
——— (Mimathyma) chevana .. 573
——— (Narsenga) parvata 573
——— (Rohana) parisatis 573
——— (———) ——— camiba .. 573
Aphnæus sp. 600
——— hypogyrus 288
——— khurdanus 600
——— lohita 600
——— peguanus 600
——— rukmini 600
——— syama 600, 601
——— (Aphnæus) concanus .. 989
——— (———) gabriel 989
——— (———) greeni 989
——— (———) ictis 990
——— (———) ——— maximus .. 990
——— (———) lilacinus.. 989, 990
——— (———) ——— abnormis 989
——— (———) lohita 989

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Aphnæus (Aphnæus) lohita zoilus .. 989
——— (———) minima 989
——— (———) nipalicus .. 990
——— (———) ——— sani .. 990
——— (———) peguana .. 989
——— (———) rukma 990
——— (———) rukmini 990
——— (———) schistacea 989, 990
——— (———) syama 989
——— (———) vulcanus.. .. 989
——— (———) ——— fusca .. 989
——— (———) zaffra 990
——— (Cigaritis) acamas hypargyrus.. 989
Apiospora camptospora.. 1292
——— montagnei 1292, 1295
Apium graveolens 1054
Apocalymnia 897
——— tenebrosa 897
Aponomma 10, 139
——— geryasi 472
Aporia agathon 591
——— (Aporia) denigrata 975
——— (———) larraldei harrietæ .. 976
——— (———) leucodica balucha .. 976
——— (———) ——— leechii .. 976
——— (———) nabellica 976
——— (———) ——— hesba. 559, 976
——— (———) soracta 975
——— (Metaporia) agathon 976
——— (———) ——— ariaca .. 976
——— (———) ——— caphusa .. 976
——— (———) ——— phryxe .. 976
Appias .. 751, 975, 1133, 1136, 1141, 1142, 1143, 1144, 1145, 1152, 1155
——— albina 592, 1137
——— hippo 592, 1137, 1141
——— indra 1136
——— lalage 592
——— leis 1137
——— libythea 1137, 1141
——— narendra.. 1136
——— nero 592
——— wardi 1137, 1145
——— zelmira 1137

NUMBER.

Appias (Appias) libythea 977
——— (———) ——— zelmira .. 977
——— (———) lyncida hippoides .. 977
——— (———) ——— latifasciata .. 977
——— (———) ——— nicobarica .. 977
——— (———) ——— taprobana .. 977
——— (———) orissa 977
——— (Catophaga) albina 977
——— (———) ——— confusca .. 977
——— (———) ——— flava .. 977
——— (———) ——— semiflava .. 977
——— (———) ———swinhœi .. 977
——— (———) ———venusta .. 977
——— (———) lankapura.. .. 977
——— (———) melania 977
——— (———) ——— adamsoni.. 977
——— (———) ——— darada .. 977
——— (———) ——— galathea.. 978
——— (———) ——— paulina .. 977
——— (———) ——— wardi .. 977
——— (———) ——— yaksha .. 977
——— (———) neomba 977
——— (Hyposcritia) confluens .. 978
——— (———) indra 978
——— (———) ——— narendra .. 978
——— (———) ——— shiva .. 978
——— (———) ——— statilia .. 978
——— (———) lalage 978
——— (———) ——— argyridina. 978
——— (———) ——— durvasa .. 978
——— (———) ——— lagela .. 978
——— (———) pseudolalage .. 978
——— (Lade) lalassis 978
Apsarasa 905
——— figurata 905
——— radians 905
Apus apus apus .. .. .. .1355
Aquila maculata.. 167
——— vindhiana .. 99, 167, 1167
Aquilegia pubiflora 703
Arabis amplexicaulis 702
——— glabra 702
Arachnechthra asiatica..95, 165, 1166, 1207, 1360
——— flammaxillaris 1207

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Arachnechthra hasselti 1207
——— longirostris 1207
Arachnothera aurata 673
——— longirostris 673
Aræa 419
—— attenuata 419
Araotes lapithis 996
Araschnia dohertyi 62
——— prorsoides 62
——— ——— dohertyi 580
Arboricola atrigularis 1215
——— intermedia 1215
——— rufigularis 675
——— torqueola 1360
Archangelica officinalis 1057
Archibuteo hemiptilopus 182
Arcilasisa 905
——— sobria 905
Arctium lappa 704
Arctomys caudatus 548
Arctomyscis 425
——— aceris 425
Ardea cinerea ..102, 169, 1161, 1168, 1219
——— insignis 1103, 1220
——— manillensis. 102, 169, 1168, 1219
——— sumatrana 1219
Ardeola grayi .. 102, 169, 1169, 1220
Ardetta cinnamomea 1220
Areca catechu 953
Arenaria orbiculata 704
Arenga wightii 355
Arenostola 900
——— phragmitidis 900
——— procera 900
Argas persicus 694
Argya caudata 89, 163, 1164
——— malcolmi 90, 163, 1164
Argynnis childreni 64
——— hyperbius 64
——— jerdoni chitralensis 619
——— pales 619
——— (Acidalia) hyperbius 581
——— (———) ——— castetsi .. 581
——— (———) ———hybrida 558,581
——— (———) ——— taprobana. 581

NUMBER.

Argynnis (Acidalia) niphe 581
——— (Argynnis) adippe jainadeva 558, 582
——— (———) ——— pallida 558, 582
——— (———) aglaia ashretha 558,582
——— (———) ———-vitatha .. 582
——— (———) childreni .. 581
——— (———) ———sakontala 581
——— (———) kamela 581
——— (———) laodice rudra .. 582
——— (———) maia 581
——— (Boloria) altissima 582
——— (———) ———mackinnoni 582
——— (———) clara 582
——— (———) ——— manis 582
——— (———) gemmata 582
——— (———) hegemone 582
——— (———) jerdoni 582
——— (———) ——— chitralensis. 582
——— (———) pales generator .. 582
——— (———) ——— sipora.. .. 582
——— (Rathora) lathonia issœa .. 582
Argyreia hirsuta.. 1286
Argyrolobium flaccidum 704
——— roseum 704, 1030
Argyroploce anemodes 873
——— antæa 872
——— centritis 872
——— compsitis 870
——— iophæa 873
——— lamyra 870
——— microplaca 873
——— pyrrhocrossa 874
——— sandycota.. 872
——— scolopendrias 871
——— scorpiastis 871
Arhopala aberrans 993
——— abœ 993
——— abseus 992
——— adala 993
——— adatha 991
——— adorea 991, 992
——— adriana 992
——— adulans 993
——— ædias 992

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Arhopala æeeta	993
——— agaba	597, 991
——— agelastus	992
——— agnis	992
——— agrata	992
——— aida	991
——— albopunctata	991
——— alea	992
——— alemon	992
——— alesia	991
——— alitæus mirabella	991
——— alpha	991
——— amantes	991
——— ——— amatrix	991
——— ammonides	993
——— anarte	991
——— andamanica	993
——— anniella	992
——— anthelus	991
——— antimuta	991
——— antura	992
——— apidanus	992
——— ——— ahamus	992
——— arama	991
——— arbegal	597
——— areste	992
——— ariel	993
——— arisba	993
——— aroa	991
——— artegal	992
——— arvina	993
——— asoka	992
——— asopia	993
——— atosia aricia	991
——— atrax	992
——— basiviridis	992
——— bazaloides	597, 991
——— bazalus	597, 991, 992
——— belphœbe	993
——— birmana	993
——— camdeo	991
——— canaraica	992
——— centaurus	991
——— ——— coruscans	991
——— ——— pirama	991
Arhopala chinensis	992
——— comica	992
——— dama	991
——— davisonii	991
——— diardi	597, 992
——— dodonea	992, 993
——— duessa	993
——— epimuta	991
——— eumolphus	991
——— ——— farquhari	991
——— ——— hellenore	991
——— fulgida	597, 992
——— fulla	993
——— ganesa	993
——— ——— watsoni	559, 993
——— hellenore	598
——— hewitsoni	992
——— hypomuta	991
——— irregularis	992
——— khamti	992
——— maxwelli	991
——— meander constanceæ	990
——— metamuta	991
——— mindanensis	991
——— mœlleri	992
——— moolaiana	991, 992
——— nicevillei	991
——— oberthuri	991
——— œnea	597, 992
——— opalina	991
——— paraganesa	993
——— ——— zephyretta	993
——— paramuta	598, 992
——— pastorella	991
——— perimuta	598, 993
——— perissa	993
——— pirithous	597, 991
——— pseudomuta	991
——— rafflesii	991
——— rama	992, 993
——— roona	992
——— selta	991
——— silhetensis	991
——— singla	597, 992
——— sounguva	992

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Arhopala subfasciata	991, 993
——— teesta	992
——— vihara	991, 992
——— viridissima	991
——— wimberleyi	991
——— yendava	992
——— zambra	991
——— zeta	992
Ariophanta bajadera	707
——— lævipes	708
Armandia lidderdali	588, 974
Armitermes neotenicus	790
Arnetta atkinsoni	604, 1002
——— binghami	1002
——— khasianus	1002
——— lesliei	1007
——— modesta	1002
——— nilgiriana	1002
——— subtestaceus	1002
——— vindhiana	1002
Arrhenotrix penicilligera	994
Arsilonche	428
——— albovenosa	428
Artamus fuscus	1202
Artemisia absinthium	705, 1028
——— annua	1028
——— aracunculus	1027
——— laciniata	1028
——— maritima	1028
——— moorcroftiana	1028
——— parviflora	1027
——— roxburghiana	1028
——— scoparia	1028
——— sieversiana	1028
——— vestita	1028
——— vulgaris	1028
Artocarpus mysorensis	1284
Arundinaria	1292
Arundo	1291
Asarcornis scutulatus	1220, 1362
Ascaris attenuata	472
——— rubicunda	472
Asparagus	1296
Aspidoceras	1349
——— badeanum	714
Aspidoceras diversiforme	714, 1352
——— iphiceroides	1352
——— pondesosum	714
——— sub-distractum	714
——— wynnei	714, 1352
Asplenium septentrionale	620
——— trichomanes	620
Assara	1252
——— albicostalis	1252
Aster asperulus	704
——— molliusculus	704
Asterina aspersa	1287
——— camelliæ	1287
——— capparidis	1287
——— carbonacea	1286
——— cincta	1286
——— concentrica	1286
——— congesta	1286
——— crustosa	1285, 1286
——— fumago	1286
——— incisa	1287
——— indica	1287
——— lawsoniæ	1287
——— magnifica	1287
——— malabarensis	1287
——— pemphidioides	1286
——— scutellifera	1286
——— spissa	1287
——— stuhlmanni	1287
Astictopterus chinensis	1001
——— herrici	604, 1001
——— jama	1001
——— kada	1001
——— melania	1001
——— nubilus	1001
——— olivascens	604, 1001
Astilbe rivularis	1059
Astragalus	1296
——— aitchisoni	1040
——— cashmirensis	1041
——— chlorostachys	704
——— ciliolatus	1039
——— contortiplicatus	40
——— falconeri	1038
——— frigidus	1039

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Astragalus leucocephalus	1041
——— meianostachys	1040
——— munroi	1042
——— prolixus	1039
——— trichocarpus	1038
Astrocyslis mirabilis	1296
Astur badius	90, 99, 167, 1167, 1213
——— palumbarius	665
Atalantia	527
Atella alcippe alcippoides	581
——— ——— ceylonica	581
——— ——— fraterna	581
——— phalantha	63, 581
Athene brama	98, 167, 1167, 1212
Athetis	435
——— ambigua	436, 438
——— bicornis	437, 441
——— bimacula	438, 443
——— bremusa	437, 440
——— castaneipars	436
——— cervina	436
——— cognata	437, 441
——— delecta	436, 438
——— divisa	436, 438
——— externa	436
——— fasciata	436, 439
——— flavitincta	437, 442
——— furvula	435
——— fuscicornis	437, 440
——— himalayica	437, 440
——— interstincta	436, 438
——— longiciliata	436, 439
——— obtusa	437, 441
——— placida	437, 441
——— prætexta	436, 438
——— sincera	437, 441
——— stygia	437, 442
——— variana	438, 443
——— vicina	437, 441
——— ——— fergana	442
——— ——— syriaca	442
Athleta	1352
Athyma asura	61
——— perius	60
Atropa belladonna	704
Attagenus	1091
Attalea funifera	947
Atylosia platycarpa	705
Atypha	435
——— pulmonaris	435
Aucha	417
——— minor	417
——— nectens	417
——— velans	417
Augiades brahma	1004
——— siva	605, 1004
——— subhyalina	1004
Aulocera loha	53
Aulographum vagum	1287
Auricularia mesenterica	147
——— polytricha	147
——— sambucina	147
Auzakia danava	60
Axiorata	910
——— leucozona	910
Axis axis	1193, 1359
——— maculata	1193
——— major	1193
——— minor	1193
——— pennantii	1193
Azanus jesous	985
——— ——— gamra	985
——— ubaldus	985
——— uranus	985
Babax lanceolatus	623
——— victorie	622
——— wadelli	184
——— yunnanensis	623
Badamia exclamationis	606, 1007
——— ladon	1007
——— thymbron	1007
Bagada	882
——— fuscostrigata	881
——— pyrochroma	886
——— spicea	882
Bagnisiella tamaricis	1292
Balansia andropogonis	1294

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Balladyna butleri	1284
Balsam	1268
Baltia butleri	975
——— sikkima	975
Baltia shawii	975
Bambusa	1284, 1292, 1294, 1295, 1296, 1297, 1299
——— arundinacea	1296
——— spinosa	1295
Bambusicola fytchii	632
Bandicota malabarica	1191
Baracus hampsoni	1001
——— septentrionum	1001
——— subditus	1001
——— ——— septentrionum	1001
——— vittatus	1001
Barbus tor	1068
Barringtonia acutangula	1286
Basilica	898
——— chrysosticta	898
Bassia latifolia	939
——— longifolia	942
Bauhinia vahlii	1291
Baza laphotes	586, 587, 674
Belemnites gerardi	1351
——— grantianus	1351
——— katrolensis	1351
——— souvanansus	1351
Berberis lycium	703
Betula	1298
——— utilis	705, 1305
Bhringa remifer	671, 1201
Bibasis sena	1007
Bibos gaur	1362
——— frontalis	1071, 1324
——— sondaicus	1072, 1323
Bidens pilosa	205, 705
——— tripartita	204
——— wallichii	205
Biduanda cyara	996
——— fabricia	996
——— melisa	996
——— nicevillei	996
——— scudderü	996
——— thesmia	996

	Number.
Bindahara ines	996
Bindahara kamorta	996
——— phocides	603, 996
——— ——— areca	996
——— sugriva	996
——— ——— moorei	996
Biophytum sensitivum	208
Bischofia javanica	1291
Bisulcia	424
——— ligustri	424
Bleptina hetlropalpia	1231
——— triangulifera	1232
Bocchoris albinalis	1263
Bocula macoma	1229
——— sinifera	1228
Bœhmeria nivea	1296, 1298
Boerlagella effusa	1297
Boletus	1294
Boophilus	695
Borassus	915, 916, 929
——— aethiopum	930
——— dichotoma	917
——— flabellifer	930, 953, 1098
——— flabelliformis	949
——— tunicata	930
Bos gaurus	241
——— sondaicus	656
Boselaphus tragocamelus	1175
Bostra mesoleucalis	1260
——— sarcosia	1260
Boswellia	844
Botaurus stellaris	158
Bothridium pythonis	471
Bothrina chennelli	594
Botryosphæria agaves	1299
——— egenuia	1299
Boucerosia crenulata	706
Brachypternus aurantius	95, 166, 1166
Brahea dulcis	362
——— filamentosa	361, 362
——— filifera	362, 364
——— robusta	362
Britha biguttata	1238
Brunella vulgaris	703
Bryophia	411

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Bryophia albiclava 411, 412
——— deceptura 411, 413
——— ereptricula 414
——— lichenea 411, 413
——— literata 411, 413
——— modesta 411, 413
——— nilgiria 411, 412
——— ochrophæa 411, 413
——— ochrota 412, 415
——— poliophæa 411, 412
——— postrochrea 413
——— ravula 412, 414
——— ——— ereptricula 415
——— ——— vandalusiæ 415
——— troglodyta 414
——— vandalusiæ 414
——— virescens 412, 414
Bryophila 411
——— conjecturalis 423
——— muralis 411
——— muscosa 423
Bryophylium calycinum 208
Bubalus bubalis 1323
Bubo bengalensis 166
Bubulcus coromandus .. 102, 169, 276, 1169, 1220
Budorcas taxicolor 1068, 1069, 1103, 1359
Bufo viridis 134, 145
Bulgaria chalybæa 1289
Bungarus cœruleus .. 281, 283, 1337, 1360
——— fasciatus 284
——— lividus.. .. 281, 282, 1363
——— niger 281, 282
Bupleurum tenue 704
Butastur liventer 586
——— teesa 99, 167, 586, 1167
Buteo desertorum 157
Butorides javanica 103, 169
Buxus sempervirens 705
Byblia ilythia 583

Cacomantis merulinus 631, 1211
——— passerinus 97

NUMBER.

Cacyparis prunifera 1234
Cadaba indica 1157
Cæoma ricini 1092
Cajanum indicum ..1293, 1295, 1296, 1297, 1298
Calænorrhinus aspersa 603
——— aurivittata 603
——— chamunda 603
——— leucocera 603
——— maculicornis 603
——— pero 603
——— pulamaya 603
——— sumitra 603
Calamistis 899
——— fusca 899
——— microsticta 900
——— prœpallens 899
——— submarginalis 900
Calamochrous bipunctalis 1269
Calamus 1287
——— fasciculatus 1294
——— tenuis 1295
Calandrella bracydactyla 156
——— ——— tibetana .. 186
Calanthea tricarinata 704
Calinaga brahma.. 64
——— buddha 583
——— ——— brahma 583
——— ——— gautama 583
——— sudassana 583
Callacanthis burtoni .. 546, 547, 1310
Calliana pieridoides 997
Calliope pectoralis 548
Callœcia 892
——— swinhœi 892
Callophis macclellandi 693
Callophrys rubi 989
Callyna 907
——— costiplaga 907
——— jugaria 907
——— monoleuca 907, 908
——— mystica 907, 908
——— semivitta 907
——— siderea 907
Calogramma 430

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Cologramma festiva 430
Calophasia lobifera 429
Calotes 8
——— jerdoni 690, 691, 1099
——— nigrilabris 1099
——— ophiomachus 1103
——— versicolor 132, 135
Calothyrium aspersum 1287
Caltoris 1005
Calymnia 897
——— flavifimbria 897
——— ochreimargo 897
——— picta 897
——— restituta 897
——— trapezina 897
Camellia 1286
——— thea .. 1284, 1285, 1287, 1295
Camena otesia 600
——— (Camena) argentea 994
——— (———) carmentalis .. 995
——— (———) cippus 994
——— (———) cotys 994
——— (———) ctesia 994
——— (———) deva 994
——— (———) icetoides 995
——— (———) lcetas 994
——— (———) lila 994
——— (Creon) cleobris 995
——— (———) ister 995
——— (Creusa) culta 995
——— (maneca) bhotea 995
Camillea bacillum 152, 1300
Camphora officinalis 759
Campophaga sykesi .. 92, 161, 1165
Canis aureus .. 301, 402, 459, 614, 837, 838, 839, 848, 1184
——— ——— indicus 402, 837
——— bengalensis 176, 403
——— dukhunensis 822
——— hyæna 402
——— indicus 837, 838, 839, 848, 1184, 1359
——— kokree 403
——— lupus 1362
——— pallipes 837, 1175, 1359
——— primævus 822

NUMBER.

Canis rufescens 403
——— (Vulpes) indicus 403
Canna 420
——— malachitis 420
——— prasinaria 420
——— pulchripicta 420
Cannabis sativa 1029
Cantoria violacea 1010
Capila jayadeva 997
——— zennara 997
Capnodes subapicalis 1231
Capnodium anonæ 1284
——— betle 1285
——— brasiliense 1285
——— eugeniarum 1284
——— fructicolum 1298
——— lanosum 1284
——— mangiferum 1284
Capopæcilma elegans 602
Capparis 1287
——— aphylla 1157
——— heyeana 1147, 1157
——— horrida 1153
——— sepiaria 1157
——— spinosa cucophylla 1296
Capra cervicapra 410, 1193
——— falconeri 301, 616, 617
——— sibirica 615
Caprimulgus asiaticus .. 96, 166, 1213
——— indicus 166
——— macrurus .. 1162, 1166, 1211
——— mahrattensis 166
——— monticola 166
Capritermes incola 775, 792
Caprona agama 999
——— elwesii 999
——— kuki 999
——— ransonnettii 999
——— ——— alida 999
——— saraya 999
——— syricthus 999
——— taylorii 999
Caradrina arenacea 440
——— belucha 441
——— conducta 886

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Caradrina crenulata 893
——— discophora 444
——— euthusa 893
——— farinacea 441
——— fergana 441
——— fuscicornis 440
——— heliarcha 893
——— hilaris.. 438
——— himaleyica 440
——— insignata 432
——— insignifica 893
——— junceti 434
——— latebrosa 432
——— lophophora 894
——— orbicularis 432
——— pectinata 431
——— præterita 432
——— prætexta 438
——— pratti 894
——— proxima 440
——— pygmœa 434
——— sebghana 435
——— syriaca 441
——— terminata 443
——— tristis 446
——— unipunctata 893
——— variabilis 440
——— venosa 435
——— vicina 441
Caragana sp. 1291
——— brevispina 704
Caranx sp. 1101
Carassius auratus 1100, 1103
Carcharodus alceæ 1000
——— altheæ 1000
——— boeticus 1000
——— dravira 1000
——— malvarum.. 1000
——— marrubii 1000
——— swinhœi 1000
Cardamine impatiens 703
Carduelis.. 547
——— caniceps .. 262, 551, 1310
Carissa carandas.. 310
Carpesium abrotanoides 705

NUMBER.

Carpodacus erythrinus .. 160, 552, 673, 1166, 1205, 1310
——— severtzovi 185
Carpophaga ænea 1214
Carum bulbocastanum 1055
——— carui 1055
——— copticum 1055
——— roxburghianum 1055
Caryota urens 69, 947, 968, 1171
Casarca rutila .. 159, 181, 619, 1088, 1220
Cassia 1145
——— absus 1051
——— obovata 1051
——— obtusa 1051
——— obtusifolia 1050
——— occidentalis 1050
——— sophera 1050
——— tora 1050
Castalius anada 596, 985
——— decidia.. 986
——— elna 596, 986
——— ethion 596, 985
——— ——— airavati 985
——— rosimon 596, 985
——— roxus 985
——— ——— manluena 985
——— ——— roxana 985
Casuarina 1300
Catachrysops cnejus 985
——— lithargyria 985
——— pandava 985
——— strabo 985
Catamecia 889
——— bacheri 889
——— furtiva 889
——— jordana 889
——— minima 889
Catapæcilma delicatum.. 997
——— elegans 997
——— subochracea 997
Catapsilia crocale 299
Cateremma 1252
——— microdoxa 1252
Catochrysops lithargyrea 596
——— strabo 596

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Catopsilia 752, 1133, 1134, 1137, 1141, 1142, 1143, 1144, 1145
——— crocale .. 592, 979, 1137, 1141
——— catilla 592, 1137
——— florella 592, 979
——— pomona 979
——— pyranthe .. 979, 1137, 1141
——— scylla 979
Caucalis anthriscus 1058
——— latifolia 1058
——— leptophylla 1058
Cedrela toonæ 1302
Cedrus deodara .. 705, 1076, 1078
——— lebani deodara.. 142
Celæna serva 886
Celænorrhinus affinis 998
——— ambareesa 997
——— andamanica 998
——— asmara 998
——— aspersa 997
——— aurivittata 998
——— badia 998
——— cacus 998
——— chamunda 998
——— clitus 997
——— concertus.. 998
——— dhanada 998
——— flavocincta 997
——— fusca 998
——— goto 998
——— leucocicirea 998
——— leucocerca 998
——— lucifera 997
——— maculicornis 998
——— munda 998
——— nigricans.. 998
——— palajava 998
——— patual 998
——— pero 997
——— plagifera 998
——— pluscula 998
——— pulomaya.. 997
——— putra 998
——— pyrrha 998
——— ruficornis.. 998

NUMBER.

Celænorrhinus spilothyrus 998
——— sumitra 997
——— zea 998
Celastrus 1285, 1296
Celsia coromandeliana 704
Celtis australis 1078
Cemas goral 247
Cenoloba 1262
——— olliteralis 1262
——— taprobana 1262
Centotheca lappacea 1291
Centropus sinensis ..97, 166, 1167, 1212
Centunculus tenellus 702
Cephalanden indica 701
Cephalosporium lecanii 1293
Cerastes 8
Cerastis lævis 891
Cerastium vulgatum 703
Cerberus rhynchops 1017
Cerceris 476, 477
——— abuensis .. 480, 483, 807
——— acuta 481, 489
——— aguata 481, 493
——— albopicta 479, 483, 798, 800, 808
——— annandalei 816
——— annexa 515
——— ariadne 815
——— assamensis 504
——— aureobarba 801, 802
——— baluchistanensis 482, 486, 516
——— basimacula 485, 497
——— belli 480, 808
——— bicornuta 814
——— bifasciata 806
——— bimaculata 485, 505
——— binghami 480, 503
——— bolanica .. 483, 486, 515
——— boysi 479, 805
——— cameroni 505
——— canaliculata 505
——— circumcincta .. 483, 486, 513
——— comberi .. 479, 484, 798
——— compta 479, 803
——— dentata 479, 796
——— dolosa 812, 813

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Cerceris downesivora 482, 507
——— elizabethæ .. 481, 498, 508
——— emarginata .. 476, 480, 484, 802
——— emortualis 491, 492
——— ephippium .. 478, 486, 498, 500
——— erythropoda 504
——— euryanthe 511
——— excavata 818
——— fastidiosa 482, 509
——— ferocior 817, 818
——— ferox 503, 816, 817, 818
——— ferreri 814
——— fervens 804, 813
——— flavopicta 481, 486, 492, 493, 502
——— flavoplagiata 481, 494
——— fletcheri 478, 500
——— fortinata .. 479, 484, 801, 807
——— funera 476, 478, 813
——— ———pallidopicta .. 478, 813
——— hilaris 481, 485, 490, 491
——— himalayensis .. 485, 490, 504
——— histrionica 798
——— humbertiana 481, 485, 491, 492
493, 496
——— ——— vicosus 492
——— inexorabilis 478, 500
——— instabilis .. 478, 483, 806, 807, 818
——— intimella 504
——— invita 818
——— kashmirensis 800
——— kirbyi 482, 494, 508
——— komarowii 499
——— lama 814
——— lanata 511
——— latibalteata .. 481, 495, 496, 497
——— lepcha 485, 496, 497, 498
——— leucozonica 483, 511
——— maculata 819
——— mastogaster 478, 505
——— melaina 479, 811
——— mellicula .. 483, 485, 514
——— nebulosa .. 482, 485, 504, 505
——— novaræ .. 479, 483, 804, 805
——— nursei 483, 485, 512
——— opulenta 480, 809

NUMBER.

Cerceris orientalis .. 481, 486, 487
——— pallidopicta 813
——— pedetes 814
——— pentadonta .. 481, 494, 496, 497
——— pictiventris 804, 805
——— protea 479, 484, 803
——— pruinosa .. 476, 480, 794
——— pulchella .. 476, 479, 484, 510, 795, 796
——— pulchra .. 480, 483, 808, 810, 811
——— quettaensis .. 479, 483, 797
——— rhyncophora .. 482, 485, 510
——— rothneyi .. 482, 486, 508
——— rubida 515, 803, 811
——— rufinodis 492, 803
——— rufoplagiata 486
——— rybiensis .. 479, 484, 800
——— saussurei .. 481, 486, 488
——— ———chrysothemis 481, 486, 488
——— seraxensis 500
——— shelfordi 815, 817
——— simlaensis 490, 491
——— smithii 814
——— specifica 481, 495
——— spectabilis .. 479, 484, 794
——— sulphurea .. 486, 492, 493, 501, 502
——— tetradonta .. 482, 486, 506, 507
——— tristis 480, 484, 810, 811
——— unifasciata 801, 802
——— vagans 515
——— velox 806
——— vigilans .. 482, 485, 511
——— violaceipennis .. 478, 484, 486
——— visthnu 480, 483, 812, 818
——— viscosus 492
——— wickwari .. 480, 484, 799
——— wroughtoni .. 482, 485, 502
Cercocebus radiatus 1176
Cercomela fusca 93, 165
Cercus peruvianus 1097
——— pterogonus 1097
Cerivoula picta 1181
Certhia himalayana 545, 1306
Cervulus areus 1068
——— grandicornis 825

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Cervulus muntjac 246, 825
——— tamulicus 825
Cervus albipes 825
——— aureus 825
——— aristotelis 1193
——— axis 459, 1193
——— curvostylis 825
——— eldi 248, 654
——— equinus 1193
——— hippelaphus 1193
——— jarai 1193
——— kashmiriensis 1325
——— leschenaulti 1193
——— melas 825
——— moschatus 825
——— muntjak 825
——— pleiharicus 825
——— porcinus 301, 459
——— ratwa 825
——— stylocerus 825
——— subcornutus 825
——— undipalpebra 1193
——— unicolor 235, 459, 1193
——— ——— equinus.. 248
——— vaginalis 825
Ceryle lugubris 1209
——— varia .. 96, 166, 662, 1166, 1209
Cethosia biblis 63, 583
——— ——— andamanica 583
——— ——— nicobarica 583
——— cyane 63, 583
——— hypsea hypsina 583
——— nietneri 584
——— ——— mahratta 584
——— thebava 583
——— viridiana 583
Cetola 429
——— dentata 429
——— rubricosta 429
Chætomium amphitrichum 1298
——— indicum 1298
Chaetopisthes heimi 786
Chætoprocta odata 988
Chætosphæria indica 1298
Chætura indica 1210

NUMBER.

Chalcophaps indica 675, 1214
Chamæleon calcaretus 687, 1103
Chamæriphes thebaica 920
Chamærops acaulis 379
——— excelsa 389
——— glabra 379, 389
——— palmetto 383, 389
——— ritchieana 72
Chamelon calcaratus 1363
Charadrius fulvus .. 180, 181, 1217
Charana mandarinus 997
——— ——— cepheis 997
Charaxes 536
——— aristogiton 55
——— hierax 55
——— ——— hipponax 55
——— ——— jalinder 55
——— ——— khasiana 55
——— ——— naganum 55
——— ——— pleistonax 55
——— kahruba 55
——— marmax 55
——— sulphureus 55
——— (Haridra) adamsoni.. .. 572
——— (———) aristogiton .. 572
——— (———) desa 572
——— (———) distanti 572
——— (———) durnfordi nicholi 572
——— (———) fabius 572
——— (———) ——— sulphureus 572
——— (———) kahruba 572
——— (———) marmax 572
——— (———) polyxena hemana 572
——— (———) ——— hierax558,572
——— (———) ——— hiponax 572
——— (———) ——— naganum 572
——— (———) psaphon 572
——— (———) ——— imna .. 572
——— (———) raidhaka 572
Chariclea vexilliger 892
Charmion ficulnea 997
——— leucographa 997
——— signata 997
Chasmina 906
——— cygnus 906

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Chasmina glabra 906
——— judicata 906
——— maculata 906, 907
——— rejecta 906
——— sericea 906
——— stigmata 907
——— tibialis 906
Chaulelasmus streperus .. 159, 181, 619, 1088, 1091, 1169
Cheilanthes syoritzii 620
Chelidon kashmiriensis 550, 1312
——— nepalensis 1205
——— urbica 160
Chelidorhynx hypoxanthum 628
Chelone imbricata 1363
——— mydas 694
Cheritra freja 602, 996
——— jafra 996
——— pseudojaffro 996
Cheritrella truncipennis .. 602, 996
Chersonesia risa 61
Chettusia leucura 157
Chibia hottentotta 1201
Chilades laius 984
——— trochilus 984
——— putli 984
Chilo araealis 1250
——— auricilia 1250
——— simplex 1250
——— suppressalis 1250
Chimarrhornis leucocephalus 184, 262, 545, 548, 551, 629, 1204
Chionachne barbata 1291
Chiripha 430
——— involuta 430
Chirita pumila 704
Chliaria cachara 996
——— kina 601, 996
——— merguia 996
——— nilgirica 996
——— othona 601, 996
——— watsoni 996
Chloroclystis dentatissima 1247
——— plicata 1248
——— polygraphata 1247

NUMBER.

Chloropsis aurifrons 1199
——— chlorocephala 1199
——— hardwickii 671
——— jerdoni 90, 1146
Chlorosplenium ærugineum 1289
Chloroxylon swietenia 741
Chœrophyllum acuminatum 703
——— cachemiricum 1056
——— capnoides 1055
——— reflexum 1055
——— virosum 1055
Chryscolaptes festivas 166
——— guttieristatus 1208
Chrysopela ornata 1363
Chrysophanus caspius 989
——— evansii 989
——— susanus 989
——— kasyapa 989
——— mandersi 989
——— pavana 989
——— phlæas 989
——— sarthus 989
——— solskyi aditya 989
——— stygianus 989
——— timeus 989
——— transiens 989
——— tseng 989
Chrysophlegma flavinucha 673
Chrysosplenium tenellum 703
Churia arcuata 1227
Chusaris rubrirena 1238
Cicer arietinum 1047, 1171, 1295
Cicuta virosa 1055
Cidaria nyctichroa 1245
Cimex rotandatus 1342
Cinclus asiaticus 551, 618
Cingalesa 890
——— strigicosta 890
Cinnamomum 1285
——— zeylanicum .. 536, 763
Circaëtus gallicus .. 99, 167, 662
Circæa cordata 704
Circus æruginosus .. 157, 1167, 1213
——— macrurus 156, 1167, 1213
——— melanoleucus 1167, 1213

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Cirrochroa aoris 64
——— mithila 64
——— (Cirrochroa) aoris 581
——— (———) —— jiraria .. 581
——— (———) —— olivacea .. 581
——— (———) bajadeta .. 581
——— (———) —— nicobarica. 581
——— (———) fasciata .. 581
——— (———) flavobrunnea .. 581
——— (———) mithila .. 581
——— (———) ——— anjira.. 581
——— (———) surya 581
——— (———) thais 581
——— (———) —— lanka .. 581
——— (Ducapa) fasciata 581
——— (———) flavobrunnea .. 581
Cissa chinensis 669, 1198
Cisticola cursitans .. 164, 1163, 1165
——— tytleri 1201
Citrus 1289, 1299
——— decumana.. 521, 527, 531, 1285
——— medica 521, 531, 1297
——— acida 1285
Cittocincla macrura 1204
Clematis barbellata 703
——— gouriana 703
——— montana 703
Cleophora dendriformis 927
——— lontaroides 925
Clerome arcesilaus 54, 571
——— cumeus assama 571
——— incerta 571
Clethrorasa 905
——— pilcheri 905
Clinophlebia 906
——— sericea 906
Clypidina notata.. 637
Cnaiolade agni 998
——— agnioides 998
——— buchananii 998
——— cacus 998
——— dan 998
——— dichroa 998
——— fatih 998
——— hamiltoni 998

NUMBER.

Cnaiolade indrani 998
——— ——— tissa.. 998
——— lankae 998
——— laxmi 998
Cnicus arvensis 704
Coccomyces vilis 1289
Coccystes coromandus 1211
——— jacobinus .. 97, 162, 1211
——— splendens 1211
Cochoa purpurea.. 673
Cocos nucifera 953, 1293, 1295
Cœlioxys 477
Cœlites epiminthia binghami 568
——— nothis adamsoni 568
Cœnonympha (Lyela) macmahoni .. 564
——— (———) myops 564
——— (———) ———macmahoni 564
Coffea arabica 1285, 1293
Coix lacryma jobi 1291
Coladenia agnioides 603
——— dan 603
Colias 1132, 1138, 1144, 1145
——— alpherakii chitralensis 979
——— cocandica thrasibulus 979
——— dubia 979
——— eogene 979
——— ——— cana 979
——— ——— leechii 979
——— erate 558, 979
——— fieldii .. 558, 592, 979, 1138
——— ——— edusina 979
——— hyale 979
——— ——— chrysodona .. 558, 979
——— ——— glicia 979
——— ——— lativitta 979
——— ——— nilagiriensis 979
——— ——— pallida 979
——— ladakensis.. 979
——— ——— berylla 979
——— stoliczana.. 979
——— ——— miranda 979
——— wiskotti 979
Collybia stipitaria 151
Colotis 1132, 1138, 1141, 1142, 1144, 1145

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Colotis amata	1139, 1140, 1143
——— danaë	1139
——— etrida	1139
——— eucharis	1139, 1140, 1144
——— fausta	1139
——— phisadia	1139, 1140
——— protractus	1139, 1140
——— tripuncta	1139
——— vestalis	1139, 1140
——— (Callosune) danae	980
——— (———) dulcis	980
——— (———) etrida	980
——— (———) ——— limbata	980
——— (———) eucharis	980
——— (———) subroseus	980
——— (Colotis) calais	980
——— (———) ——— albina	559, 980
——— (———) ——— amatus	559, 980
——— (———) cypræa	980
——— (———) dynamene	980
——— (———) intermissus	980
——— (———) modesta	980
——— (———) protractus	980
——— (———) puellaris	980
——— (———) vestalis	980
——— (Madais) fausta	980
——— (———) fulvia	980
——— (———) tripuncta	980
Coluber molurus	447
Columba intermedia	99, 167
——— leuconota	182
——— leuconyx	1312
——— rupestris	182, 183
Colutea nepalensis	704
Polystictus flavus	148
Condica	882
——— cupentia	882
Convolvulus arvensis	704
Conyza balsamifera	885
Copernicia	912
——— cerifera	913, 915
Copsychus saularis	93, 165, 1165, 1204
Coptotermes ceylonicus	777
——— formosanus	777
——— heimi	775, 777
Coptotermes travians	777
Coracias affinis	1209
——— indica	95, 166, 1166
Corchorus sp.	1298
——— acutangulus	221, 227
——— capsularis	220
——— fasicularis	221
——— olitorius	221
——— tridens	221
——— trilocularis	221
Cordyceps falcata	1294
——— racemosa	1294
——— ridleyi	1294
Coriandrum sativum	1058
Corticium cœruleum	147
Corvus corax	183
——— corax	1355
——— lawrencii	1355
——— tibetanus	1355
——— insolens	669, 1197
——— lawrencii	1355
——— macrorhynchus	89, 163, 549, 621, 669, 1077, 1164, 1197
——— monedula	549, 1304
——— splendens	89, 163, 248, 1164, 1197, 1198
——— tibetanus	1355
Corydalis govaniana	702
——— rutæfolia	702
Corynelia clavata	1298
——— fructicola	1298
Corypha australis	350
——— cerifera	913
——— filifera	362
——— gebanga	66
——— glabra	382
——— macropoda	66
——— minor	379
——— palmetto	382
——— pilearia	81
——— pumila	379
——— rotundifolia	349
——— talliera	70, 71
——— thebaica	920

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Corypha umbraculifera	66, 67, 68, 70, 358, 382, 949
Corythocichla striata	1199
Corythoderus gibbiger	786
Cosmia affinis	897
——— bipuncta	894
——— restituta	897
Cosmophila erosa	698
——— figlina	1227
——— mesogona	1226
Cotile riparia	160, 185, 618
——— sinensis	94, 165, 1205
Cotoneaster acuminata	703
Coturnix communis	157
——— coromandelica	100, 168, 1168
Crabro	477
Crambus albiceps	1250
——— endopolia	1249
——— neurigrammalis	1249
Craniophora	424
——— fasciata	424, 425
——— ligustri	424
——— nigrivitta	424, 425
——— nubilata	424, 425
Crateropus canorus	89, 97, 164, 1164
Cratœgus oxyacantha	705
Cratœva religiosa	1147
Cremnomys gen. nov.	340, 341
——— cutchicus	340, 341, 342, 641, 828, 841
Crepis fœtida	703
Creteus cyrina	1003
——— meleagrina	1003
——— parca	1003
Crex pratensis	546
Criniger burmanicus	1200
——— flaveolus	1200
Critonia ochracealis	1251
Crobylophora siglias	108
Crocidura	400
——— bidiana	847
——— macrotis	847
——— murina	1182
——— nilgirica	847
——— nitidofulva	847
Crocidura perrotteti	847
——— travancorensis	847
——— stoliczkana	847
Crocodilus palustris	301
——— porosus	1363
Crocopus chlorogaster	89, 167, 1163, 1167
——— phœnicopterus	1213
Crossiura pennicillatum	997
Crotalaria alata	209
——— hirsuta	209
——— humifusa	209
——— juncea	1295
——— medicaginea	1031
——— mysorensi	209
——— prostrata	209
——— sessiliflora	209
Crusimetra gen. nov.	855
——— verecunda	855
Cryphia	411
——— receptricula	411
Crypsithyris fissella	115
——— soporata	115
——— spectatrix	115
Cryptoblabes flavizonalis	1257
——— scotochroalis	1257
Cryptolopha tephrocephala	627
Cryptomyces pongamiae	1289
Cryptovalsa indica	1298
——— planiuscula	1298
——— rabenhorstii	1298
Crysophila	912
Ctenoptilum multiguttuta	998
——— vasava	909
Cucifera	916
——— thebaica	920
Cuculus canorus	97, 161, 618, 631, 1211, 1313
——— micropterus	1211
Cucurbitaria agaves	1298
Culicicapa ceylonensis	162, 672, 1074, 1165, 1203
Cuminum cyminum	1058
Cuon dukhunensis	822, 848, 1102
——— grayiformis	822
Cupha erymanthis	63

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Cupha erymanthis andamanica .. 581
——— ——— lotis 581
——— ——— maja 581
——— ——— placida .. 581
——— nicobarica 581
Cupitha lycorias 1004
——— purrea 1004
——— tympanifera 1094
Curetis angulata 597
——— arcuata 988
——— bulis 596, 988
——— ——— angulata 988
——— ——— discalis 988
——— ——— malayica 988
——— dentata 596, 988
——— discalis 597
——— felderi 988
——— sperthis 988
——— stigmata 988
——— thetis 988
——— ——— gloriosa 988
——— ——— nicobarica 988
——— ——— saronis 988
Cursorius coromandelicus 101, 163, 1168
Cuspidia 425
——— psi 425
Cyamopsis psoraolides 1034, 1295
Cyanchum glaucum 703
Cyanecula 552
——— suecica 156, 1165
Cyaniris albocærulea 594
——— diluta 594
——— jynteana 594
——— marginata 594
——— placida 594
——— puspa 594
——— transpecta 594
——— (Bothrinia) chennellii .. 983
——— (Cyaniris) akasa 982
——— (———) albidisca 982
——— (———) albocæruleoides .. 982
——— (———) albocærulea .. 982
——— (———) agriolus cælestina .. 557, 982
——— (———) ——— jynteana .. 982

NUMBER.

Cyaniris (cyaniris) agriolus victoria .. 982
——— (———) bothrinoides .. 982
——— (———) dilecta 982
——— (———) huegeli .. 557, 983
——— (———) lanka 982
——— (———) lilacea 982
——— (———) limbata 982
——— (———) ——— placida .. 982
——— (———) marginata 982
——— (———) melæna 982
——— (———) oreas 983
——— (———) ——— oreana .. 983
——— (———) parrishii 983
——— (———) puspa 983
——— (———) ——— cyanescens .. 982
——— (———) puspargiolus .. 982
——— (———) singalensis 983
——— (———) transpecta 982
——— (Notarthrinus) musina .. 982
——— (———) ——— musinoides .. 982
——— (———) vardhana .. 982
Cyaniroides libna 987
Cyanops asiatica 673, 1209
——— ramsayi 674
Cydia 863
Cygnus bewicki 273
——— musicus 274
Cyllogenes janetæ 54, 570
——— suradeva 570
Cymbidium 1299
Cynodon dactylon 1285, 1291
Cynœlurus jubatus 648, 1175
Cynopterus 1321
——— marginatus 846
——— ——— ellioti 846
——— sphinx 846
Cynthia erota 63, 581
——— ——— asela 581
——— ——— pallida 581
——— ——— saloma 581
——— pura 581
Cyon dukhunensis 822
Cyornis melanoleucus 672, 1203
——— rubeculoides 672, 1203

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Cyornis supercilliaris 161, 1165
——— tickelli 92, 165, 1165
Cypselus affinis .. 96, 166, 659, 1091, 1166
——— subfercatus 1210
Cyrestis thyodamas 61
——— (Apsithra) cocles 579
——— (———) ——— andamanica... 579
——— (———) natta 579
——— (———) periander 579
——— (———) ——— binghami. 579
——— (Chersonesia) peraka 579
——— (———) rahria 579
——— (———) rahrioides .. 579
——— (———) risa 579
——— (Cyrestis) nivea 579
——— (———) ——— nivalis .. 579
——— (———) ——— tabula .. 579
——— (———) thyodamas 579
——— (———) ——— andamanica.. 579
Cystopheris fragilis 620
Cytocanis.. 892
——— denticulosa 892, 893

Dadica 893, 894
——— lineosa 893
Dacalana vidura burmana 994
Dacryopsis sp. 147
Dafila acuta 159, 181, 658, 1088, 1169, 1221
Dalbergia sp. 1291
——— sissoo .. 108, 1291, 1292, 1298
Daldinia concentrica 152, 1300
——— gollani.. 1300
——— vernicosa 1300
Danais chrysippus 49
——— limniace 49, 531, 535, 536, 1131
——— melanea 49
——— melanoides 49
——— plexippus 49
——— septentrionis 49
——— tytia 49, 64
——— (Chittira) fumata 560
——— (———) melaneus 560

NUMBER.

Danais (Chittira) nilgriensis 560
——— (———) plateniston 560
——— (———) tytia 560
——— (Nectaria) hypermnestra lineata 560
——— (Parantica) aglea 560
——— (———) ——— melanoides.. 560
——— (———) ——— melanoleuca 560
——— (———) ——— phormion .. 560
——— (———) eryx agleoides .. 560
——— (Radena) similis exprompta .. 560
——— (———) ——— micobarica .. 560
——— (———) ——— vulgaris .. 560
——— (Ravadebra) aspasia 560
——— (———) crocea 560
——— (Salatura) alcippus 560
——— (———) chrysippus 560
——— (———) ——— alcippoides 560
——— (———) ——— dorippus 560
——— (———) hegesippus 560
——— (———) melanipus indicus.. 560
——— (———) ——— nesippus.. 560
——— (———) nepalensis 560
——— (———) plexippus 560
——— (Tirumala) gautama 560
——— (———) ——— gautamoides 560
——— (———) limniace 560
——— (———) ——— mutina .. 560
——— (———) melissa dawidarum 560
——— (———) ——— musikanas.. 560
——— (———) ——— septentrionis 560
Daphne oleoides.. 705
Darpa hanria 1000
Daseochæta 420
——— brevipennis 421
——— chrysochlora 422
Dascochæta discibrunnea 423
——— fasciata 421, 422
——— muscosa 423
——— pallida 421
——— vigens 421
——— viridis 421
Dasyscypha emerici 1289
Dasyses 127
Datisca cannabina 704
Datura stramonium 704

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Daucus carota 1058
Daulia argyrostrotalis 1262
Delias 1131, 1134, 1142, 1144, 1145, 1153
—— aglaia 591, 1148, 1151
—— agoranis 1151
—— agostina 591, 1151
—— belladonna 1151
—— descombesi 591, 1151
—— ethira 1148
—— eucharis 1134, 1135, 1148, 1149, 1152
—— hierta 1134, 1148
—— ithiela 591
—— metarete 1148
—— thysbe 591, 1151
—— (Delias) aglaia 975
—— (——) —— beata 975
—— (——) belladonna 975
—— (——) —— ithiela .. 975
—— (——) —— sanaca .. 975
—— (——) berinda 975
—— (——) perspicua 975
—— (——) thysbe 975
—— (——) —— kandha .. 975
—— (——) —— pyramus .. 975
—— (Piccarda) agostina 975
—— (——) descombesi 975
—— (——) —— auriga .. 975
—— (——) —— leucacantha .. 975
—— (——) —— leucogæa.. 975
—— (——) eucharis 975
—— (——) hyparete ciris .. 975
—— (——) —— ethire .. 975
—— (——) —— hierte .. 975
—— (——) metarete 975
—— (——) infumata 975
—— (——) singhapura agoranis. 975
Delphinium denudatum.. 703
Delta 429
—— indica 430
—— intermedia 430
—— stolifera 429
Dendrelophis proarchos.. 284
—— tristis 284
Dendrobium gratississimun 1105

NUMBER.

Dendrobium ochreatum 1105
—— parishii 1105
Dendrocitta himalayensis 669
—— rufa ..89, 163, 669, 1164, 1198
Dendrocopus atratus 673
—— himalayensis 545
—— macii 1208
Dendrocyena javanica .. 103, 169, 1088, 1169, 1220
Dercas brindaba 978
—— lycorias 592, 978
—— —— decipiens 978
—— verhueli doubledayi 978
—— —— pallidus 978
Desmodium sp. 1291
—— podœarpum 705
—— rufescens 1285
Deudoryx diara 993
—— epijarbas 602, 993
—— gaetulia 993
—— hypargyria 993
Deuterocopus alopecodes 105
—— socotranus .. 104, 105
—— viticola 104
Deutzia staminea 703
Diathus angulatus 703
Diatrype chlorosarca 1299
Dicæum chrysorrhœum 1207
—— cruentatum 1207
—— erythrorhynchus. 1159, 1166, 1207
Dichoceros bicornis 674, 1210
Dichocrocis macrostidza 1264
Dichorragia nesimachus 574
Dicrurus ater 90, 164, 585, 586, 1073, 1165, 1200, 1327
—— cærulescens .. 90, 164, 1165
—— cineraceus 586, 1200
—— longicaudatus.. 164
Dictamnus albus.. 703
Didissandra lanuginosa 704
Dietyophora phalloidea 151
Dilipa morgiana 57, 573, 1008
Dimerium wattii 1285
Dimerosporium aterrimum 1285
—— erysiphoides 1285

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Dimerosporium fumago 1285
——— mangiferum 1284
Dioscorea 1295
Diospyros 84
——— montana 1286
Diphtera deceptura 413
——— fasciata 422
——— imray 423
Diphtherocome 420, 421
——— pallida 420
Dipsacus inermis.. 203
——— strictus 203
Dipsadomorphus 280
——— ceylonensis 279
——— nuchalis 279
——— trigonata .. 1360, 1363
Dipus indicus 404
Dirtera 1150
Discophora celinde andamanensis .. 571
——— ——— continentalis .. 571
——— deo 571
——— lepida 571
——— tullia 55, 571
Dissemurus paradiseus .. 164, 671, 1165, 1201
Dissura episcopus .. 169, 1168, 1219
Distira 693
Dodona adonira 65, 584
——— ageon 64
——— angela 584
——— binghami 584
——— deodata 584
——— ——— longicaudata 584
——— dipœa 64, 584
——— dracon 584
——— durga 584
——— egeon 584, 1008
——— eugenes 64, 584
——— ouida 65, 584
Dœdolea aulacophylla 150
Doleschallia bisaltide andamansis .. 580
——— ——— ceylonica .. 580
——— ——— continentalis .. 580
——— ——— malabarica .. 580
——— ——— pratipa 580

NUMBER.

Doleschallia continentalis 63
——— malabarica 63
Doma 916
Dophla derma 58
——— nara 58
——— patala 287, 698, 699
——— sahadeva 58
——— taoonana 287, 699
Dothidea annulata 1290
——— aspidea 1290
——— demersa 1290
——— repens 1290
——— rhytismoides 1290
——— tamaricis 1292
——— viventis 1291
——— vorax 1292
Dothidella bambusicola.. 1292
——— dispar 1292
Douma 916
——— thebaica 920
Downesia brettinghami.. 507
Draco 301
Drepana bicostata 1272
Drina donina 996
Drosera lunata 705
Dryonastes chinensis 669
Dryophis mycterizans .. 9, 1103, 1336
Ducula griseicapilla 674
Dumassia sp. 1297
——— villosa.. 1297
Dumetia albigularis 301
——— hyperythra 90, 164
Dupetor flavicollis 1220
Dyrzela 893
——— plagiata.. 893
Dysmilichia 444
——— calamistrata 444
——— gemella 444

Ebenus stellata 1034
Echinolampas discoides.. 1350
Echinops cornigerus 704
——— niveus 704

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Echis carinata .. 16, 142, 1339, 1340
Egnasia mesotypa 1230
——— tenella 1230
Elacagnus umbellata 702
Elacosticta meifolia 1054
Elanus cæruleus 167, 1167, 1213
Elaphria 435
——— morpheus 435
Elegistis, gen., nov. 125
——— cunicularis 125
Elydna 893
——— atripuncta 895
——— bipuncta 894
——— bisignata 895
——— bosca 893
——— erigida 893
——— lineosa 894
——— ochracea 895, 896
——— ochreipuncta 894, 895
——— plagiata 893
——— reclusa 893
——— rectilinea 895
——— renalis 895
——— transversa .. 893, 895, 896
——— truncipennis 894
Elymnias malelas 54
——— patna 54
——— undularis 54
——— vasudeva 54
——— (Agrusia) andersonii 571
——— (———) esaca 571
——— (Bruasa) penanga chelensis .. 571
——— (Elymnias) cottonis 570
——— (———) ——— obnubila. 570
——— (———) dara dædaion .. 570
——— (———) hypermnestra caudata .. 570
——— (———) ——— tinctoria.. 570
——— (———) ——— traterna... 570
——— (———) ——— undularis. 570
——— (———) panthera mimus.. 570
——— (Melynias) malelas 571
——— (———) ——— nilamba... 571
——— (———) ——— saueri .. 571
——— (———) nesaea cortona .. 570

NUMBER.

Elymnias (Melynias) nesaea timandra.. 570
——— (———) patna 571
——— (———) ——— patnoides. 571
——— (———) pealii 570
——— (———) singhala 570
——— (Mimadelias) deva 571
——— (———) thycana .. 571
——— (———) vasudeva .. 571
——— (———) ———burmensis. 571
Emarginula australis 638
——— dilecta 637
——— elongata 637
——— radiata 637
——— (Clypidina) radiata .. 637
Emballonura 1321
Emberiza aureola 1205
——— buchanani 156
——— leucocephala 618
——— luteola.. .. .. 156, 552
——— melanicterus 1312
——— rutila 673
——— schœniclus 262
——— stewarti 154, 160
——— stracheyi 545, 1312
Endothia hypocreoides 1295
Enhydrina valakadien 693
Enispe cycnus 55, 572
——— euthymius 572
——— ——— tessellata 54
——— tessellata 572
Eogenes alcides 1007
Eoxylides tharis 996
Epactris melanchæta 114
——— thyreota 114
Ephyra validaria.. 1248
Epichloe bambusae 1294
——— cinerea 1294
——— sclerotica 1292
Epilecta opulenta 418
——— pulcherrima 418
Epilobium brevifolium 704
Epimys 340, 770
——— arboreus 1190
——— blanfordi.. 824
——— brahminicus 1190

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Epimys rattus 1175
——— rufescens ..405, 823, 841, 850, 1175, 1189, 1190
——— rufus 1190
——— vicerex 1362
Epinephele (Chortobius) cœnonympha. 564
——— (———) maiza .. 564
——— (———) neoza .. 564
——— (———) pulchella. 563, 564
——— (———) pulchra. 563, 564
——— (Maniola) cheena .. 563
——— (———) davendra .. 563
——— (———) ——— brevistigma. 563
——— (———) ——— latistigma. 563
——— (———) lycaon interposita. 563
——— (———) narica .. 563
——— (———) tenuistigma ... 563
Epiphytic andromedœ 250
Epiplema fulvihamata 1243
Eragrostis tenuifolia 1294
Erebia orixa 54
——— (Callerebia) annada .. 557, 564
——— (———) ——— orixa .. 564
——— (———) daksha 564
——— (———) hybrida 564
——— (———) nirmala 564
——— (———) ——— saxicola .. 564
——— (———) scanda 564
——— (Dallacha) hyagriva 564
——— (Hemadara) narasingha .. 564
——— (Paralasa) kalinda 564
——— (———) mani 564
——— (———) shallada 564
Ergolis ariadne 64, 583
——— merione 64, 583
——— ——— taprobana 583
Erigeron 705
Erinaceus blandfordi 175
——— collaris 832, 833
——— grayi 832
——— indicus 832
——— jerdoni 175

NUMBER.

Erinaceus micropus 833, 834
——— pictus 833
——— spatangus 832
Eriobotrya japonica 1296
Erionota anitta 1003
——— attina 1003
——— batara 1003
——— cruda 1003
——— hiraca 1003
——— lara 1003
——— latreillei 1003
——— thrax 604, 1003
——— ——— acroleuca 1003
Erismatura leucocephala 1360
Erites angularis 565
——— argentina 565
——— ——— ines 565
——— medura falcipennis 565
——— rotundata 565
Erynnis comma dimila 1007
Erysimum hieracifolium 703
Erysiphe communis 1284
——— martii 1284
Eryx 452
——— conicus .. 2, 4, 5, 7, 13, 14, 16, 301, 1103
——— jaculus 2, 3, 4, 10
——— johni .. 2, 3, 4, 5, 12, 14, 301, 451, 1103, 1341, 1360
Esacus recurvirostris .. 101, 1074, 1216
Euaspa milionia 988
Eublepharis hardwickii 1341
——— ——— macularius 1341
Eucheria lyra 397
Eucosma brachyptycha 869
——— calligrapha 865
——— celerata 863
——— cremnitis 860, 864
——— cyanopis 866
——— helota 869
——— isogramma 866
——— lasiura 868
——— legitima 865
——— litigiosa 867
——— ludicra 867

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Eucosma melanoneura 866
——— numellata 868
——— semicurva 864
——— solidata 865
——— speculatrix 866
——— spicea 867
Eudynamis honorata .. 162, 277, 1167, 1211
Eugenia 84
——— jambolana 1286, 1296
Eulabes intermedia 1197, 1202
Eulaphygma 431
——— abyssinia 431
Eulepis arja 56
——— athamas 55
——— eudamippus 56
——— moori 56
——— schreiberi 56
——— (Eulepis) arja 572
——— (———) athamas 572
——— (———) ——— agrarius .. 572
——— (———) jalysus 572
——— (———) marginalis 572
——— (———) moori sandakanus .. 572
——— (———) schreiberi assamensis. 572
——— (———) ——— wardi .. 572
——— (Murwareda) delphis 572
——— (———) ——— concha .. 572
——— (———) dolon 572
——— (———) ——— centralis .. 572
——— (———) ——— grandis .. 572
——— (———) eudamipus .. 573
——— (———) ——— nigrobasalis .. 573
——— (———) magniplaga .. 572
——— (———) nepanthes .. 573
Eumenes 477
Eunetta falcata 1220
Eu-Opuntia 1096
Euperia 897
——— trapezina 897
Euphorbia pilosa 704
Eupithecia substristigera 1246
Euplæca core 531, 536
——— coreta 536

NUMBER.

Euplæca kollari 536
Euplexia albomaculata 885
Euplœa 535
——— alcathœ 49
——— diocletiana 49
——— dione 49
——— hopei 49
——— klugii indigofera 49
——— mulciber 49
——— splendens 49
——— (Calliplœa) mazares ledereri .. 561
——— (Crastia) andamensis .. 561
——— (———) biseriata 561
——— (———) camarabzaman .. 561
——— (———) camorta 561
——— (———) climena scherzeri .. 561
——— (———) core 561
——— (———) ——— asela 561
——— (———) ——— vermiculata .. 561
——— (———) crameri 561
——— (———) cremeri 561
——— (———) ——— frauenfeldii. 561
——— (———) defigurata 561
——— (———) esperi 561
——— (———) godarti 561
——— (———) ——— layardi .. 561
——— (———) modesta 561
——— (———) nicevillii 561
——— (———) oliracea 561
——— (———) simulatrix 561
——— (———) subdita 561
——— (Danisepa) diocletianus .. 562
——— (———) ——— ramsayi 562
——— (Euplœa) corus 561
——— (———) ——— phœbus .. 561
——— (———) ——— vitrina .. 561
——— (Isamia) adamsoni 561
——— (———) brahma 561
——— (———) midamus spargarita .. 561
——— (———) ——— splendens .. 561
——— (———) rœpstorfii 561
——— (Penoa) alcathœ 561
——— (———) ——— æsatia .. 561
——— (———) ——— doubledayi .. 561
——— (———) arida 561

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Euplœa (Penoa) deione 561
——— (——) ——— limborgii .. 561
——— (——) ——— menetriesi .. 561
——— (Salpinx) leucogonys 562
——— (———) leucostictos .. 562
——— (———) ——— nowaræ 562
——— (———) klugii 562
——— (———) ——— crassa .. 562
——— (———) ——— kollari .. 562
——— (———) ——— sinhala .. 522
——— (———) coreoides 561
——— (Stictoplœa) coreta 561
——— (———) ——— montana .. 561
——— (———) harrisi 561
——— (———) ——— hopei .. 561
——— (Trepsichrois) mulciber .. 561
——— (———) ——— kalinga. 561
Eupoditis 21, 303
——— aurita 722
——— edwardsi 274, 304, 322, 335, 1333, 1334
——— macqueenii 325
Euphrasia officinalis 703
Eupolia 889, 890
——— licentiosa 889
Euripus alcathœoides 573
——— cinnamoneus 573
——— haliastus 573
——— halitherses 58, 573
——— ——— cinnamomeus .. 58
——— ——— isa 58
——— isa 573
——— nyctelius 573
Eurois albicostata 878
Eurotium herbariorum 1284
Eurya acuminata 1292
Eurystomus orientalis 1209
Eurytermes assmuthi 775
Eusemia transiens 909
Eustegnia.. 897
——— diffinis 897
Eustroma pilosa 1245
Eutermes biformis .. 775, 787, 793
——— heimi 775

NUMBER.

Eutermes rubidus 775
Euthales 411
——— algæ 411
Euthalia apicalis 59
——— appiades 59
——— eriphyle 59
——— franciæ 59
——— ——— attenuata 59
——— garuda 59
——— jahnu 59
——— kama 59
——— kesava 59
——— lepidea.. 59
——— lubentina 59
——— phemius 59
——— telechinia 59
——— (Bassarona) goodrichi .. 574
——— (———) ——— gupta.. 574
——— (———) ira 574
——— (———) recta 574
——— (———) teuta 574
——— (———) ——— teutoides.. 574
——— (Chucapa) franciæ 575
——— (Cynitia) cocytus 575
——— (———) lepidea 575
——— (———) ——— andersoni.. 575
——— (Dophla) derma 575
——— (———) ewelina 575
——— (———) ——— laudabilis .. 575
——— (Euthalia) apicalis 576
——— (———) binghami.. .. 575
——— (———) eriphylæ 576
——— (———) garuda 575
——— (———) ——— acontius .. 576
——— (———) ——— diversa 558, 576
——— (———) jama 576
——— (———) kanda 576
——— (———) lubentina.. .. 575
——— (———) nais 576
——— (———) phemius 575
——— (———) wasanta 576
——— (———) zichri 575
——— (Haramba) appiades 575
——— (———) ——— adima .. 575
——— (———) ——— julii .. 575

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Euthalia (Haramba) appiades sedeva ... 575
——— (———) jahnu 575
——— (———) khasiana 575
——— (Kirontisa) telchinia 575
——— (Labranga) duda 575
——— (———) durga 575
——— (Limbura) nara 575
——— (Mahalda) iva 575
——— (———)sahadeva 575
——— (———)——— narayana 575
——— (Nora) kesava 575
——— (———) ——— rangoonensis .. 575
——— (Rangara) dunya 575
——— (Saparona) cibaritis 575
——— (Tasinga) anosia 575
——— (Zalapia) patala 575
——— (———) ——— taooana .. 575
Eutrema, primulœfolium 703
Eutypella vitis 1298
——— zizyphi 1298
——— Euzophera nivricostella ..1253
——— subterebrella 1253
Everes argiades 595, 985
——— ——— dipora 985
——— ——— parrhasius 985
——— diporides 985
——— kala 595, 985
——— moorei 985
——— parrhasius 595
——— potanini 985
Evodia roxburghiana 543
Evolvulus alsinoides 704
Excalfactoria chinensis 1215

Fagopyrum cymosum 217
——— esculentum 217
——— tataricum 217
Falco jugger 99, 167
———peregrinator 99, 1090
———peregrinus 157, 1213
Fanklinia bachanani 91, 164
——— gracilis 164, 1201
Felis affinis 400, 401, 835, 848, 1182, 1359

NUMBER.

Felis bengalensis 301, 1359
——— caracal 835
——— chaus .. 229, 396, 400, 401, 631
——— ——— affinis 400
——— ——— furax 400
——— ——— nilotica 400
——— domestica 1106
——— jacquemontii 400, 401
——— jubata 648
——— kutas 400, 401
——— leo 238, 1359
——— leopardus 648, 1182
——— nebulosa 1359
——— ornata 175, 835, 1362
——— pardus .. 237, 458, 648, 1182, 1319, 1362
——— rubiginosa 1183
——— servalina 835
——— temmincki 237, 1102
——— tigris 1102, 1318, 1359
——— viverrina 1359
——— (Lynchus) erythrotus .. 400, 401
Feronia elephantum 1296
Ferula jœschkeana 1057
——— thomsoni 1057
Fiagaria indica 703
——— vesca 703
Ficus .. 1284, 1289, 1301, sp., 1290
——— bengalensis 1284
——— carica 1300
——— udbia 1297
——— glomerata 1284, 1299
——— gossypina 1290
——— hispida 1290
——— infectoria 1290
——— mysorensis 1290
——— ——— pubescens 1290
——— religiosa 856, 1290
——— retusa 1284
——— roxburghii 702
——— scandens 1290
Fimbristylis sp. 1291
——— dichotoma 1291
Fissurella bombayana 637
——— bombayensis 1299

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Fissurella lima 637
Flemingia fruticulosa 705
Floccifera 893
——— erigida 893
Fœniculum vulgare 1056
Francolinus chinensis 632, 675
——— pictus 100, 168
——— pondicerianus 101, 168, 1168
——— vulgaris 100
Fringilla montifringilla 262
Fringillauda sordida 551
Fuckelia carteri 1299
Fulica atra .. 101, 163, 180, 1168, 1215
Fuligula fuligula 181, 1088, 1089
Funambulus 1191
——— indicus 822
——— palmarum ..7, 8, 822, 823, 849, 1175, 1186
——— pennanti .. 403, 404, 823, 839, 849, 1175, 1186
——— tristriatus 1186

Gagea persica 703
Galerita cristata 94, 185
——— deva 94, 165
Galium 1289
Gallicrex cinereus 1215
Gallinago cœlestis 158, 179, 181, 269, 271, 633, 1106, 1168, 1218
——— raddei 271
——— gallinula .. 158, 264, 1103
——— major 677
——— megala .. 269, 1083, 1360
——— nemoricola 633, 677
——— solitaria .. 179, 181, 633, 677
——— stenura 158, 181, 633, 677, 1103, 1168, 1218
Gallinula chloropus .. 101, 162, 1215
Gallus ferrugineus . 675, 1168, 1214
——— sonnerati 1360
Galloperdix lunulata 100, 168
——— spadicea 100
Galtha palustris 208

NUMBER.

Gampsorhynchus rufulus 1199
Gangara pandia 1003
——— thyrsis.. 1003
Ganoderma applanatum 148
——— lucidum 148
——— resinaceum 148
Gaphara 882
——— tetera 882
Garæus flavipicta 1244
Garrulax belangeri 669, 1198
——— leucolophus 1198
——— moniliger 1198
——— pectoralis 669, 1198
Garulus leucotis 585
Gasada tripunctata 602
Glaucidium radiatum 98, 1163
Gazella bennetti 410, 655, 843, 1068, 1194
——— christii 410
Geaster saccatus 1278
Gecinulus grantia 1208
Gecinus chlorolophus 1208
Gegenes karsana 1007
——— lefebrii 1007
——— nostrodamus 1007
——— pumilio 1007
——— pygmaeus 1007
Geijera salicifolia 759
Geisha distinctissima .. 607, 608, 609
Gennæus 652
——— cuivieri 1214, 1215
——— horsfieldi 1215
——— lineatus 460
——— prendergarsti 1215
Gentiana capitata 704
——— contorta 704
——— kurroo 704
Geocichla citrina 1204
——— cyanonotus 1166
Geometra rufifrontaria 1248
Geranium collinum 227
——— divaricatum 704
——— grandiflorum 227
——— lucidum 703
——— palustre 227

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Geranium pratense 227
——— tuberaria 227
Gerbera lanuginosa 703
Gerbillus cuvieri 404
——— erythrourus 840
——— hurrianæ 840
——— indicus 404, 840
Gerydus ancon 981
——— assamensis 981
——— bigsii 981
——— boisduvalii 981
——— ——— longeana 981
——— croton 981
——— gopara 981
——— irroratus 593, 981
——— symethus 981
Geum elatum 704
Gibberella calamia 1294
Girardinia heterophylla .. 227, 1029
Glareola lactea 1216
——— orientalis 163, 1216
Glaucidium cuculoides 586, 1313
——— radiatum 1159
Glauconia blanfordi 12
Glossogyne pinnatifida 205
Glycosmis pentaphylla .. 521, 527, 531
Glyphodes athysanota 1269
——— capriniodes 1268
Gnaphalium luteoalbum 704
Goenycta 423
——— niveiguttata 423, 424
Golunda coffœus 408
——— ellioti .. 406, 407, 408, 824, 842, 851, 1175, 1192
——— hirsutus 1192
——— meltada 406
——— newera 408
Gomalia albofasciata 1000
——— littoralis.. 1000
Gonepteryx rhamni nepalensis.. .. 978
——— zaneka 978
——— ——— chitralensis .. 978
——— ——— zanekoides .. 978
Gordius zorattarii 619
Gortyna 890, 891

NUMBER.

Gortyna leucostigma 890, 891
——— micacea 891
Gossypium 1295
——— indicum 1298
Graculus eremita.. 549
Graphiphora fasciata 439
——— interstincta 438
——— stellata 894
Graucalus macii .. 92, 165, 262, 1165, 1202
Graculus erimeta 1304
Grevillea robusta.. 1297
Grus antigone .. 101, 168, 1168, 1216
——— communis 157
——— nigricollis 181, 183
——— sharpii 1216
Gryllotalpides 1341
Grypomys.. 340
——— gleadowi 176, 341
Guazuma tomentosa 1293
Gunomys kok .. 407, 851, 1175, 1191
——— varius 1103
Gymnodactylus stoliczkæ 132, 135, 136
Gymnorhis flavicollis .. 93, 162, 1166
Gymnoscelis lobata 1246
——— subtrigosa 1246
Gypaëtus barbatus 182, 663
Gyps fulvescens 1331, 1332
——— fulvus 98, 167, 1331, 1332
——— himalayensis 618, 1332
——— indicus 167
——— tenuirostris 1212
Gypsonoma anthracitis 863
Gypsophila cerastoides 704

Habenaria 171
——— susannæ 1129
Hadena funesta.. 886
——— leonina 886
——— littoralis 431
——— pauperata 886
——— retina 431
——— spargens 886
——— taprobanæ 885

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Hadjina 886
——— chinensis 887, 888
——— cinerea 887, 888
——— cupreipennis 887
——— grisea 887, 889
——— lutosa 886
——— modestissima 887, 888
——— poliastis.. .. .. 887, 889
——— pyroxantha 887, 889
——— viscosa 887, 888
Hæmanthus multiflorus.. 1360
Hæmogregarina cantliei 10
——— pococki 472
Halcioniscus 638
Halcyon pileata 1210
——— smyrnensis ..96, 166, 1166, 1210
Halenia elliptica.. 704
Haliaëtus leucogaster 1213
——— leucoryphus 662, 1213
Haliastur indicus 167
——— indus 99, 665, 1167, 1213
Halpe aina 1005
——— albipectus 1005
——— astigmata 1005
——— aucma 1005
——— brunnea 1005
——— cerata 1005
——— ceylonica.. 1005
——— debilis 1005
——— decorata 1005
——— egena 1005
——— evershedi 1005
——— fusca 1005
——— gupta 1005
——— homolea 605, 1005
——— honorei 1005
——— hyrie 605, 1005
——— hyrtacus 1005
——— kumara 1005
——— knyvetti 1005
——— marta 1005
——— masoni 1005
——— moorei 1005
——— ormenes 1005
——— ornata 1005

NUMBER.

Halpe palawea 1005
——— perara 1005
——— separata 605, 1005
——— sikkima 605, 1005
——— sitala 1005
——— teliga 1005
——— wantona 1005
——— zema 605, 1005
Hamitermes belli 775
——— brevicorniger 792
——— quadriceps 775, 792
——— (Synhamitermes) quadriceps 792
Hantana infernus 997
Hapalotis 435
——— gutvula 435
Hardwickia 844
Harpactes erythrocephalus .. 674, 1211
——— orescius 1211
Harpoceras dynastes .. 714, 1350, 1351
——— eairense 1350
——— hecticum 714, 1352
——— ignobile 1352
——— lairense 1351, 1353
——— lunula 1352
——— trilineatum 714, 1352
Harpyiocephalus.. 1321
Hasora alexis 1007
——— anura 1007
——— badra 606, 1007
——— butleri 1007
——— ——— malayana 1007
——— chabrona 606, 1007
——— chromus 606, 1007
——— chuza 606, 1007
——— coulteri 1007
——— philetas 1007
——— quadripunctata 1007
——— sena 606
——— simplicisima 1007
Hebomoia.. .. 1132, 1140, 1142, 1143, 1144, 1145
——— ceylonica 980
——— glaucippe .. 593, 980, 1140
——— ——— australis 980

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Hebomoia glaucippe roepstorfii .. 980
Hedera helix 705
Hedysarum astragaloides 1043
——— laxiflorum 1044
——— microcalyx 1042
——— oachemirianum 1044
——— strobiliferum 1044
Helcyra hemina 56, 573
Helicops carinicauda 1009
——— chistosus 1103
——— schistosus ..1009, 1012, 1014, 1015
——— ——— yunnanensis ..1015
Heliopais personata 1216
Heliothis cilisca 892
——— exprimens 892
Helospora.. 84
Helotium pusense 1288
Helotropha 890
——— leucostigma 890
Helvelia crispa 1288
Hemicercus canente 1208
Hemichelidon 546
——— sibirica .. 545, 1203, 1305, 1306, 1362
Hemicurus guttatus 1204
——— immaculatus 1204
Hemidictyum ceterach 620
Hemilophus pulverulentus .. 263, 1208
Hemipus picatus 91, 1202
Hemitragus jemlaicus 300
Hemixus flavala 1200
——— macclellandi 1200
Henicurus leschenaulti 672
——— maculatus .. 258, 259, 550
Heptapleurum octophyllum 607
——— venulosum 1288
Heracleum cachemiricum .. 703, 1058
——— candicans 1058
——— canescens 1058
——— pinnatum 1057
——— thomsoni 1057
Hermenias, gen. nov. 852
——— epidola 852
——— implexa 852

NUMBER.

Hermienias, pachnitis 852
——— palmicola 853
Herodias alba .. 169, 618, 1169, 1220
——— garzetta 102, 169, 1169, 1220
——— intermedia 169, 1168
Herona marathus 573
——— ——— andamana 573
——— ——— angustata 573
Herpestes auropunctatus 176, 237, 238
——— ferrugineus 175
——— frederici 401
——— griseus 175
——— malaccensis 401
——— mungo 175, 401
——— nemo 175
——— nyula 175
——— pallidus 401
——— pallipes 175, 176
——— smithi 237, 238
——— vitticollis 237, 238
Herpystis pallidula 862
Hesperia alpina 1000
——— ——— cashmirensis 1000
——— durwazica 1000
——— evanidus 1000
——— galba 1000
——— hellas 1000
——— lugens 1000
——— nanus 1000
——— orbifer 1000
——— phlomidis 1000
——— ——— geron 1000
——— poggei 1000
——— sao 1000
——— superna 1000
——— zebra 1000
Hesperoptenus tickelli 1180
Hesperotenus 1321
Hestia (Hestia) jasonia.. 560
——— (———) ——— agarmarschana. 560
——— (———) ——— arrakana .. 560
——— (———) ——— cadelli.. .. 560
——— (———) ——— hadeni.. .. 560
——— (———) ——— kanarensis .. 560
——— (———) ——— malabarica .. 560

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Hestia (Hestia) jasonia margherita .. 560
Hestina melanina 573
——— nama 57, 573
Heterographis argentescens 1251
Hevea brasiliensis 1293
Hexagona polygramma 150
——— tenuis 150
Hibiscus abelmoschus 226, 1026
——— cancellatus 226, 1026
——— cannabinus 698
——— esculentus 1027
——— ficulneus 1025
——— gibsoni.. 1025
——— pungens 1026
——— sabdariffa 226, 1025
——— solandra 226, 1024
——— surattensis 1024
——— trionum 226, 1023
——— vitefolius 1024
Hidari bhawani 1003
——— hypœpa 1003
——— irava 1003
Hieracium vulgatum 703
Hieraëtus fasciatus 1090
Hierococcyx sparverioides 97, 1167, 1330
——— varius 162, 1211
Himatopus candidus 163, 180, 1168, 1217
Hipœpa opacaria 888
Hipposideros 1321
——— apiculatus 1178
——— ater 829
——— atratus 829
——— aureus 1178
——— bicolor 829
——— blythii 1178
——— cineraceus 829
——— dukhunensis .. 1178, 1181
——— fulgens 1174, 1179
——— fulvus 829, 830, 1174, 1175, 1179
——— murinus..829, 830, 1174, 1179
——— penicillatus 1178
——— speoris 1178
——— templetonii 1178
Hirundo daurica scullii 659

NUMBER.

Hirundo erythropygia 94, 165
——— fluvicola 94, 165
——— gutturalis 1205
——— javanica 1206
——— nepalensis 1206
——— rufula 659
——— rustica 160
——— smithii 94, 165, 1166, 1206
——— tytleri 1206
Hodgsonius phœnecuroides 550
Hodotermes macrocephalus 774
Holcus sorghum 1171
——— spicatus 1250
Holigarna longifolia 1297
Holstiella usambarensis.. 1296
Homoptera eremochroa 1222
——— ruficolora 1222
Hoplopterus ventralis 1217
Horaga albimacula 997
——— andamana 997
——— moulmeina 997
——— onyx 997
——— ——— cingalensis 997
——— rana 997
——— sikkima 997
——— viola 997
Houbara 21, 324
——— macqueenii .. 303, 325, 328, 336
——— undulata 325, 328
Houbaropsis 21, 722
——— bengalensis 1110
Howea forsteriana 355
Huphina .. 1134, 1135, 1144, 1145, 1155
——— copia 592
——— dapatha 592
——— lea 977
——— nadina 592, 977
——— ——— andamana 977
——— ——— cingala 977
——— ——— remba 977
——— nerissa 977, 1135
——— ——— dapha 977
——— ——— evagete 977
——— ——— lichenosa 977
——— ——— phryne 977

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Hyæna hyæna .. 402, 837, 848, 1175, 1359
——— striata 402
Hyalomma ægyptium 695
Hyarotis adrastus 604, 1002
——— phœnicis 1002
——— praba 1002
Hyboma 425
——— divisa 425
——— strigosa 425
Hydræcia 891
——— basalipunctata 891
——— khasiana 891
——— micacea 891
——— tibetana 892
Hydrelia conjugate 878
Hydrilla lugens 446
Hydrochelidon hybrida 158, 1218
Hydrocotyle javanica 704
Hydrophasianus chirurgus 101, 168, 1168, 1216
Hydrophis 693
Hymenochæte strigosa 148
Hyoscyamus niger 704
Hypacanthis spinoides .. 262, 1074, 1075, 1329
Hypætra heterographa 1223
——— pulcherrima 1223
——— tepesceus 1223
Hypena abnormalis 1238
——— atrirena 1237
——— colabalis 1238
——— mesogramma 1236
——— molybdota 1237
——— thermophæa 1236
Hypenagonia brachypalpia 1240
——— flavisigna 1239
——— longipalpis 1239
Hypericum perforatum 703
Hypermnestra balucha 974
——— helios 974
——— ——— maxima .. 974
Hyphæne 915, 916
——— cucifera 920
——— indica .. 917, 918, 919, 920, 921
——— thebaica .. 917, 920, 921

NUMBER.

Hyphantidium 1252
——— albicostalis 1252
——— sericaria 1252
Hypocalamia 911
——— meterythrax 911
Hypocrea carteri 1294
——— flavo-virens 1294
——— grossa 1294
——— nilgherrensis 1294
——— rugulosa 1294
——— subrufa 1294
——— undulata 1294
Hypocrella panici 1294
——— semiamplexa 1294
Hypocreopsis carteri 1294
——— undulata 1294
Hypolaïs caligata 159
——— rama 159, 1165
Hypolimnas alcippoides 580
——— bolina 63, 580
——— diocippus 580
——— inaria 580
——— misippus 580
Hypolycæna andamana 996
——— erylus 601, 996
——— thecloides 996
Hypomyces chrysospermus 1294
Hypoperigea 443
——— albonotata 443
——— leprosticta 443, 444
——— tonza 443
——— turpis 444
Hypopteris bambusæ 1296
Hypoptris apiospora 1292
Hypotænidia striata 1215
Hypothymis azurea 169, 672
Hypoxylon atropurpureum 1299
——— carteri 1302
——— coccineum 1299
——— deciduum 1299
——— fusco-purpureum 1299
——— hookeri 1299
——— indicum 1300
——— multiforme 1300
——— ochraco-fulvum 1299

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Hypoxylon perforatum	1299
——— pictum	1297
——— pistillare	1302
——— rubiginosum	1300
——— stygium	1299
——— udum	1299
——— ustulatum	1300
——— vividum	152, 1299
Hypsipetes concolor	671, 1200
——— psaroides	1200
Hypsirhina bilineata	1018
——— enhydris	1017
——— furcata	1018
——— plumbea	1010, 1017
——— sielboldi	1360
Hystrix cristata indica	408
——— cuneiceps	771, 843
——— leucura	408, 459, 771, 843, 1192
——— ——— cuneiceps	843
——— malabarica	408
——— zeylonensis	408
Hysudra hades	993
——— selira	993
Iambia	415
——— harmonica	416
——— inferalis	415
——— nocturna	416
——— rufescens	416
——— thuaitesi	416
——— transversa	416
Iambiodes	416
——— anormalis	416, 417
Iambrix salsala	604
Ianthia rufilata	550, 1306
Ibidorhynchus struthersi	183, 545
Ibis melanocephala	102, 163, 1168, 1219
Ichneumon edwardsi	401
——— griseus	401
Icthyosamus	465
Ictinaëtus malayensis	586
Ideopsis deopsis	560
Ilattia calamistrata	444
Ilattia cupreipennis	887
Ilerda androcles	599, 600, 989
——— ——— viridis	559, 989
——— brahma	599, 600, 989
——— epicles	598, 599, 989
——— hybrida	989
——— kohmensis	598, 599, 989
——— moorei	989
——— sena	989
——— tamu	989
——— viridipunctata	599, 600, 989
——— ——— kala	599, 989
Ilex	1285
——— dipyrena	703, 1290, 1296
Impatiens amphorata	222
——— amplexicaulis	221
——— brachycentra	223
——— edgeworthii	222
——— laxiflora	223
——— miscranthemum	223
——— racemosa	223
——— scabrida	222
Imperata arundinacea	1291
Indogermanus	1349
Indigofera anabaptista	1036
——— arrecta	1295
——— cordifolia	210
——— gerardiana	703
——— hirsuta	1036
——— linifolia	210
——— sumatrana	1295
——— trifoliata	1034, 1285
——— trita	1034
Inocotis davisoni	1219
——— papillosus	102, 170, 1168
Inodes blackburniana	389
——— palmetto	382
Interrupti perisphinctes	1349
Inula cuspidata	704
Ipomœa	1286
Iraota mæcenas	990
——— rochana	990
——— timoleon	990
——— ——— nicevillei	990
Irene puella	1199

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Iris nepalensis	702
Irpex canescens	148
—— flavus	148
—— vellereus	148
Isachæ	1291
Ischæmum laxum	1291
Isma iapis	1002
—— protoclea	1002
Ismena amara	605, 1007
—— anadi	1007
—— ataphus	1007
—— consobrina	1007
—— etelka	1007
—— gomata	606, 1007
—— harisa	605, 1007
—— jaina	605, 1007
—— —— fergusonii	1007
—— lorquinii	1007
—— mahintha	1007
—— œdipodea	1007
—— tuckeri	1007
—— vasutana	605, 1007
Isoura metaphæa	1228
Issoria sinha	63, 581
Ithagenes cruentus	178
Iton barea	1005
—— semamora	1005
—— watsoni	1005
Itys microstictum	1002
Ixias	975, 1134, 1136, 1144, 1145
—— evippe	978
—— latifasciata	592
—— marianne	978, 1136
—— —— nola	978
—— nola	1136
—— pyrene	978, 1136
—— —— andamana	978
—— —— cingalensis	978
—— —— citrina	978
—— —— conectens	978
—— —— letifasciata	978
—— —— pallida	978
—— —— pirenassa	978
—— —— rhexia	978
Iyngipicus canicapillus	673
Iyngipicus hardwickii	95, 166, 1166
Lynx torquilla	161
Jambrix luteipalpis	1002
—— salsala	1002
—— stellifer	1002
Jasminum	1287
—— officinale	703
Jaspidea	411
—— algæ	411
Jocheæra	425
—— alni	425
Juglans regia	705
Junonia almana	62, 579
—— atlites	61, 579
—— hierta	62, 579
—— iphita	61, 579
—— lemonias	61, 579
—— orithya	61, 579
Justicia pubigera	705
Kala ban	705
Kallicephalus willeyi	1020
Kallima albofasciata	581
—— horsfieldii	580
—— —— alompra	580
—— —— philarchus	580
—— inachus	63, 580
—— —— huegeli	580
—— —— limborgi	580
—— kuyvetti	63, 581
—— wardi	580
Kerana diocles	604, 1003
Kerivoula	1321
—— picta	1103, 1181, 1195
Ketupa zeylonensis	98, 166, 1212
Koruthaialos butleri	1001
—— gemmifer	1001
—— hector	1001
—— palawites	1001
—— rubecola	1001

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Koruthaialos xanites 1001
Kretzschmaria heliscus 1300
——— kurziana 1300

Lachesis gramineus 1339
——— lanceolatus 296, 298
——— monticola 284, 693
Lachnea geneospora 1288
Lachnella nilgherrensis 1289
Lactuca scariola 703
Læstadia camelliæ 1295
——— perusia.. 1295
——— theæ 1295
Lagerheimia carteri 1289
Lampides bochus 595, 987
——— ——— nicobarica 987
——— celeno 595, 987
——— ——— kinkurka 987
——— cleodus 595, 987
——— cœrulea 987
——— conferena 595
——— coruscens 987
——— elpis 595, 987
——— —— chinee 596
——— —— kankena 987
——— kondulan 987
——— lacteata 987
——— pura 987
——— rogersi.. 987
——— subdita 987
Lamyristis, gen. nov. 131
——— leucopselia 131
Lanius collurioides 1202
——— cristatus 155, 1165, 1202
——— erythronotus ..91, 164, 546, 1165, 1311
——— isabellinus 155
——— lahtora 91, 164
——— tephronotus 184
——— vittatus 164, 1165
Lantana 1186
Laphygma 433
——— apertura 433
——— exempta 433

NUMBER.

Laphygma exigua 433, 434
——— imperviata 432
——— obliterans 432
——— procedens 432
——— retrahens 432
Laringa castelnaui 583
——— horsfieldii andamanica .. 583
——— ——— glaucescens .. 583
Larus argentatus 662
——— brunneicephalus .. 180, 1089, 1218
——— ichthyætus 1218
Larvivora brunnea 624, 1305
——— cyanea 670
Lasiobotrys lonecerae 1285
Laspeyresia lencostoma.. 876
——— optica 875
——— primigena 877
——— prolopha 875
——— pulverula 876
——— turifera 876
Latania 915, 916, 924
——— aurea 927
——— burbonica 346, 924
——— chinensis 346
——— commersonii 925, 926
——— loddigesii .. 926, 927, 928
——— plagæcoma 925
——— rubra 925
——— verschaffeltii 927
Lathraea squamosa 703
Lathyrus altaicus 1049
——— luteus 1050
Laticilla burnesi 1080
Laurus 1287
Lavatera kashmiriana 1022
Lawsonia alba 1287
Lebadea martha 60, 176
——— attenuata 576
——— ismene 576
Leggada booduga.. 338, 339, 406, 772, 824, 850, 1175, 1188, 1189
——— cinderella 770, 842
——— dunni 339, 340, 842
——— platythrix 405, 770, 772, 773, 824, 842, 845, 850, 1188

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Leggada platythrix sadhu	842
——— sadhu	770, 842
Leguminosæ	1291
Lehera eryx	997
——— skinneri	997
Lembosia cæspitosa	1287
Lens esculenta	1049
Lentinus cæspitosus	151
——— cretaceum	151
——— curreyanus	151
——— manipularis	151
——— multiformis	151
——— subnudus	151
Lenzites ochroleuca	150
——— repanda	150
Leocyma apicalis	908
——— dianæ	906
——— vestæ	906
Leontopodium alpinum	703
Leonurus cardiaca	704
——— gardiaca	207
Lepidogma chlorophilalis	1257
——— melanolopha	1258
Lepidoscia globigera	124
Lepiota badhami	151
——— sordescens	151
Lepitoreuma	425
——— ovata	425
Lepterodius sacer	1220
Leptina grata	435
Leptocircus curius	588, 974
——— meges	588, 974
——— ——— indistincta	588, 974
——— ——— virescens	974
——— virescens	588
Leptopœcile sophiæ	184
Leptoptilus dubius	158, 1168, 1219
——— javanicus	1161, 1168, 1219
Leptorhabdos benthamiana	206
Leptosphæria agaves	1296
——— eriobotryæ	1296
——— indica	1296
——— sacchari	1296
Leptosia	1131, 1134, 1143, 1144, 1145
——— xiphia	975, 1134, 1145
Leptosia xiphia nicobarica	975
Lepus sp.	176
——— dayanus	176, 843
——— hurgosa	1192
——— joongshaiensis	843
——— kurgosa	1192
——— nigricollis	230, 338, 339, 396, 409, 460, 1192, 1359, 1362
——— oiostolus	179
——— ruficaudatus	177, 338, 339, 396, 409, 1106, 1359
——— simcoxi	338, 339, 409, 825, 851
——— tibetanus	615
Lerwa lerwa	178
Lespedeza elegans	1034
——— gerardiana	1034
——— juncea	705, 1034
Lethe bhairava	52
——— brisanda	50, 51
——— chandica	53
——— confusa	51
——— dinarbas	50, 51
——— goalpara	53
——— guinihal	52
——— insana	50
——— kansa	53, 286, 698, 699
——— khasiana	53
——— latiaris	52
——— mekara	53
——— pulahoides	53
——— rohria	50
——— scanda	52
——— serbonis	53
——— siderea	52
——— sidonis	52
——— sinori	53
——— sura	53
——— verma	52
——— vindhya	53
——— yamoides	53
——— (Blanaida) bhadra	567
——— (———) khasiana	567
——— (———) muirheadi	568
——— (———) pulaha	568
——— (———) ——— pulahoides	568

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Lethe (Blanaida) yama	568
—— (——) yamoides	568
—— (Debis) chandica	566
—— (——) distans	566
—— (——) dynsate	566
—— (——) flanone	566
—— (——) kansa	566
—— (——) —— zeugitana	566
—— (——) ladesta	566
—— (——) mekara	566
—— (——) satyavati	566
—— (——) serbonis	566
—— (——) vaga	566
—— (——) vindhya	566
—— (——) zuchara	566
—— (Dionana) margaritæ	566
—— (——) naga	566
—— (Kerrata) callipteris	567
—— (——) lyncus	567
—— (——) tristigmata	567
—— (Lethe) brisanda	566
—— (——) confusa	566
—— (——) —— gamhara	566
—— (——) daretis	566
—— (——) drypetis	566
—— (——) —— tamuna	566
—— (——) —— todara	566
—— (——) dyrta	566
—— (——) —— nilgiriensis	566
—— (——) europa	566
—— (——) —— nudgara	566
—— (——) isana	566
—— (——) —— dinarbas	566
—— (——) niladana	566
—— (——) ragalva	566
—— (——) rohria	566
—— (——) yoga	566
—— (Nemetis) minerva	566
—— (——) —— tritogenia	566
—— (Rangbia) bhairava	567
—— (——) gulnihal	567
—— (——) —— peguana	567
—— (——) latiaris	567
—— (——) —— perimele	567
—— (——) scanda	567
Lethe (Sinchula) maitrya	567
—— (——) nicetas	567
—— (——) nicetella	567
—— (——) siderea	567
—— (——) sidonis	567
—— (——) vaivarta	567
—— (——) visrava	567
—— (Tansima) æenopa	567
—— (——) verma	567
—— (——) —— sintiça	567
—— (Zophœssa) andersoni	567
—— (——) armandii	567
—— (——) atkinsonia	567
—— (——) baladeva	567
—— (——) —— asia	567
—— (——) dura	567
—— (——) —— gammici	567
—— (——) goalpara	567
—— (——) —— narkunda	567
—— (——) jalaurida	567
—— (——) —— elwesi	567
—— (——) kabruni	567
—— (——) mœlleri	567
—— (——) ramadeva	567
—— (——) sura	567
Leucania hesperica	903
—— inferens	903
—— proscripta	903
Leucocosmia	893
—— ceres	893
—— reclusa	893
Leucodrepana furvicosta	1271
Leucoptera sphenograpta	108
Leucotermes ceylonicus	776
—— indicola	775, 776
—— tenuior	777, 778
Libythea celtis	584
—— lepita	584
—— lepitoides	584
—— geoffroyi alompra	584
—— —— hauxwelli	584
—— lepita	64
—— myrrha	64
—— —— rama	584
—— narina	584

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Libythea rohini 584
——— libera 584
——— sanguinalis 584
Licuala 76
——— elegans 84
——— grandis 85, 86
——— horrida 71
——— longipes 80
——— paludosa 81, 83
——— peltata .. 77, 79, 80, 84
——— ramosa 81
——— rotundifolia 350
——— spinosa .. 81, 82, 83
——— brevidens .. 81
——— cochinchinensis.. 81
Ligusticum marginatum 1056
Ligustrum compactum 703
Limacinula butleri 1284
——— theæ 1284
Liminitis daraxa 60
——— dudu 60
——— zayla 60
——— (Auzakia) danava 576
——— (Bhagadatta) austenia .. 576
——— (Moduza) procris 576
——— (———) ——— anarta .. 576
——— (———) ——— calidasa .. 576
——— (Najas) trivena 576
——— (———) ligyes 576
——— (Parasarpa) zayla 576
——— (Sumalia) daraxa 576
——— (———) dudu 576
——— (———) zulema 576
Limnocnida 301
Limonidromus indicus 1206
Limosa belgica 157, 180
Limulus sp. 1360
Linota rufo-strigata 185
Liopicus mahrattensis .. 95, 166, 1166
Lioptila capistrata 249
Liosis albertisii 466
Liphyra brassolis 997
Listeria dudgeoni 994
Litsæa angustifolia 1297
——— wightiana 1297

NUMBER.

Litsea 759
——— chinensis.. .. .. 536, 763
——— consimilis 703
——— sebifera 536
Livistona 343
——— sp. 355
——— altissima 349
——— australis 350, 353
——— chinensis .. 346, 355, 924
——— filifera 362
——— hoogendorpii 356
——— humilis.. .. 353, 354, 355
——— inermis 350, 354
——— jenkinsiana 344
——— mauritiana 346
——— olivæformis 355
——— rotundifolia 349
——— speciosa 345
——— subglobosa 349
——— ternatensis 362
Lobesia genialis 869
Locustella straminea 155
Lodoicea 915, 916
Logania andersoni 987
——— marmorata 981
——— massalia 981
——— watsoniana 981
Lonicera 1285
Lontarus domestica 930
Lophidermium pinastri 1287
Lophiostigma xerophilum 1281
Lophoceros birostris .. 96, 166, 263, 1166
Lophophorus refulgens 178, 182
Lophospizias trivirgatus.. 1167
Lophotriorchis kieneri .. 265, 674
Lophotyna 890
——— albirena 890
Lophygma caradrinoides 434
——— cycloides 434
Lopophanes melanolophus 545
Loranthus 1151
——— elasticus 1151
——— longiflorus 1151
——— scurrula 1151
Loriculus vernalis 674, 1212

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Lotongus alienа 1003
——— avesta 1003
——— calathus 1003
——— maculatus 1003
——— parthenope 1003
——— sarala 1003
——— sarus 1003
——— tamiata 1003
——— traviata 1003
——— zalates 1003
——— zeus 1003
Lotononis leobordea 1031
Lourea vespertilionis 228, 1034
Loxia curvirostra scotica 547
Loxura atymnus 602, 996
——— arcuata 996
——— prabha 996
——— surya 996
Lusciniola melanopogon .. 154, 155
Lutianus jahngarah 694
——— sebæ 693
Lutra vulgaris 614
Lycæna jaloka 620
——— (Albulina) asiatica 983
——— (———) pheretes lehana .. 983
——— (Aricia) antiqua 984
——— (———) astrarche 984
——— (———) eumedon 984
——— (———) jermyni 984
——— (———) medon 984
——— (Bryna) ariana 984
——— (———) chitralensis 984
——— (———) drasula 984
——— (———) drunela 984
——— (———) eros balucha 984
——— (———) ——— sutleja 984
——— (———) fugitiva 984
——— (———) icarus 984
——— (———) persica 984
——— (———) pseuderos 984
——— (———) stoliczana 984
——— (———) ——— balucha .. 984
——— (Latiorina) ellisi 983
——— (———) orbitulus jaloka .. 983
——— (———) ——— leela .. 983

NUMBER.

Lycæna (Latiorina) orbitulus walli 559, 983
——— (Lycæna) galathea 983
——— (———) metallica 983
——— (———) omphissa 983
——— (———) younghusbandi .. 983
——— (Phengaris) atroguttata sartoides .. 984
——— (———) sarta 984
——— (———) ——— gracilis .. 984
——— (Plebeius) bracteata 983
——— (———) christophi 983
——— (———) cytis 983
——— (———) iris 983
——— (———) loewii 983
——— (———) ——— chamanica .. 983
——— (Scutilantides) baton cashmirensis .. 983
——— (———) hylas 983
——— (———) vicrama .. 983
Lycæna (Tiora) devanica .. 559, 984
——— (———) gracilis 1008
——— (———) lysias 1008
——— (———) sebrus 984
——— (———) ——— shandura 559, 984
Lycænesthes emolus 594, 986
——— ———topa 559, 986
——— lycænina .. 594, 986
Lychnis fimbriata 704
Lycodon aulicus 1360
——— fasciatus .. 279, 280, 1335
——— gammiei .. 279, 280, 1335
Lygosoma himalayanum .. 133, 143, 144
Lyncornis cerviniceps 1211
Lyonetia melanochalca 108
——— praefulva 109
Lyroderma lyra .. 397, 846, 1177
——— ——— caurina .. 397, 1177
Lysimachia chenopodioides 702
——— japonica 702

Mabuia carinata .. 301, 1161, 1341
——— macularia 1161
Macacus sinicus 1176

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Macalla brachyscopalis 1258
——— eumictalis 1259
Macaria honoria 1244
——— subalbataria 1244
Machæropteris 131
——— ceramina .. 128,129
——— frenigera .. 128, 130
——— halistrepta 128
——— horrifera .. 128, 129
——— limatula .. 128, 130
——— melicera .. 128, 130
——— phenax .. 127, 128,129, 130
——— receptella 127, 128, 129
——— taciturna .. 127, 128
——— vernacula .. 128, 130
Machilus macrancha 763
——— oberatissima 759
Machlolopus haplonotus.. 89, 163, 1164
——— spilonotus 669
Macna prætextata 1232
Macrochlamys pedina 708
——— (Eurychlamys) platychlamys .. 707, 708
Macrophoma musæ 146
Macropisthodon 1012
——— plumbicolor 1014
Macropodia semitosta 152
Macropteryx coronata .. 96, 166
Macropygia ruficeps 261, 675
——— tusalia .. 261, 632, 675
Mærua arenaria 1157
Mahathala (Apporosa) atkinsoni .. 990
——— (Mahathala) ameria .. 990
Malachra capitata 698
Mallobathra cellulata 125
Malva sylvestris 704, 1023
———verticillata 1022
Malvastrum tricuspidatum 224
Mamestra albomaculata .. 431, 884
——— dolerosa 885
——— prodita 886
Mangifera indica .. 1284, 1286, 1289, 1297
Mangusta (Herpestes) nyula 401
Manihot utilissima 1296
Manis brachyura 844

NUMBER.

Manis crassicaudata 844
——— indicus 844
——— pentadactyla 844
——— (Phatagis) laticauda 844
Manto martina 996
Marapana cautiperas 1235
——— diplogramma 1235
Marasmarcha atomosa 106
——— phlyctaenias 106
Marasmius spaniophyllus 150
Mareca penelope .. 159, 181, 1088, 1220
Marmaronetta angustirostris 684
Marmessus boisduwalii 996
——— lysias 996
——— moorei 996
Martes flavigula 1320
——— foina 1320
Martynia dlandra 207
Marumba bengalensis 1270
Masca 1229
——— abactalis 1229
Massarina marginata 1296
——— usambarensis 1296
Massepha rufescens 1263
Mastigophorus indentifascia 1232
——— magniplaga 1232
Mastiphanes 425
——— edolata 425
Matapa aria 1003
——— druna 1003
——— pulla 1003
——— purpurascens 1003
——— sasivarna 1003
——— shalgrama 1003
Matopo 429
——— celecta 429
——— typica 429
Mazus rugosus 705
Mecistoptera albisigna 1240
Medemia 915
Medicago falcata 1033
——— lupulina 1285, 1288
——— sativa.. .. .. 1033, 1288
Megacronycta 425
——— hastulifera 425

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Megaderma horsfieldi 1177
——— lyra 379
——— spasma 1177
——— ——— trifolium 1177
——— trifolium 1177
Megalæma marshallorum 681
Megalurus palustris 169
Megisba malaya 594, 982
Melampsora ricini 1092
Melampsorella aspidiotus 1094
——— caryophyllacearum .. 1092
——— ricini 1092
Melanargia halimede 562
Melanitis bela 54
——— gakissa 570
——— ismene.. 54
——— leda ismene 570
——— phedima bela 570
——— ——— bethami 570
——— ——— tambra 570
——— ——— varaha 570
——— zitenius auletes 570
——— gokala 570
——— kalinga 570
Melanochlora sultanea 1199
Melanocyma faunula faunuloides .. 571
Melanomma citricola 1297
——— glumarum 1297
Melanospora parasitica 1293
——— yamiæ 1293
Melasina 126
Melia azadirachta 942
Melilotus alba 705, 1033
——— indica 1032
——— parviflora 1032
Meliola amphitricha 1285
——— asterinoides major 1285
——— butleri 1285
——— cladotricha 1286
——— clavulata 1286
——— contigua 1286
——— densa 1285
——— diospyrl 1286
——— fumago 1285
——— geniculata 1286

NUMBER.

Meliola indica 1286
——— mangiferæ 1286
——— palmicola 1286
——— zig-zag 1285
Melissoblaptes monochroa 1249
Melitæ (Melitæ) didyma 583
——— (———) ——— chitralensis .. 583
——— (———) dodgsoni 583
——— (———) ferghana 583
——— (———) maracandica 583
——— (———) mercea 1008
——— (———) robertsi 583
——— (———) saxatilis shandura .. 583
——— (———) sindura 582
——— (———) ——— balba.. 558, 582
——— (———) ——— balbita .. 582
——— (———) ——— ikkimensis .. 582
——— (———) trivia mixta 558, 583, 1008
——— (———) ——— persea 583
Melittophagus swinhoei.. 1209
Mellivora indica.. .. .. 839, 1359
Melophus melanicterus 94, 165
Melursus ursinus.. 238
Mendicago falcata 704
Merganser castor 274
Mergus albellus 619
——— castor 181
Meriones hurrianæ 840
Merops persicus.. .. .. 101, 162
——— philippinus 96, 161, 162, 674, 1269
——— viridis 95, 162, 1166, 1209
Merula 249
——— atrigularis 154, 156
——— maxima 680, 681
——— obscura 673
——— unicolor 1306
Metachora bambusæ 1292
Metachrostis 411
——— muralis 411
Metaponia pusilla 1311
Metasphæria boehmeriæ 1296
——— capparidis 1296
Metopidius indicus 101, 169, 1168, 1216
Metria platypoda 1229
Micrapatetis 910

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Micrapatetis flavipars 910
——— orthozona 910
——— pyrastis 910
Microcerotermes biroi 790
——— heimi 775, 789
——— papuanus 790
Microcichla scouleri .. 257, 550, 1327
Microcœlia 425
——— fragilis 425
Micromys 1314
Micropeltis conferta 1287
——— orbicularis 1287
Micropus melanocephalus 1200
Microsemyra 903
——— pallida 903
Microtermes incertus .. 775, 788, 789
——— mycophagus 775
——— obesi.. 775, 779, 787, 788, 789
——— sindensis .. 775, 787, 788, 789
——— tragardhi 789
Microthyrium aspersum 1287
——— microscopicum 1287
Microtus 1314, 1322
Milichia 444
——— gemella.. 444
Millardia 340, 341, 342
——— comberi 407
——— listoni 407
——— meltada ..341, 406, 407, 408, 840, 850, 1175, 1190
Millingtonia hortensis 1082
Milvus govinda ..99, 138, 167, 1082, 1167, 1213, 1332
——— melanotis 167, 182
Mimusops hexandra 147
Minopterus 1321
Mirafra assamica 1207
——— cantillans 94, 162
——— erythroptera .. 94, 165, 1166
Mixornis rubricapillus 585
Moduza procris 59
Molpastes bengalensis 90
——— burmanicus 625, 1200
——— hæmorrhous .. 90, 164, 1164
——— intermedius 256, 257

NUMBER.

Molpastes leucogenys 256, 257
——— leucotis 90
——— nigripileus 671
Monodes 878
——— conjugata 878
——— fissistigma 878
——— nucicolora 878
——— trifissa.. 878
Monopis florilega 114
——— viatica 114
Monotropa uniflora 704
Montifringilla adamsi 185
——— rufricollis 185
Monttivaltic chariensis 1352
Morchella bohemica 1288
——— conica 151, 1288
——— ——— acuminata 1288
——— deliciosa 1288
——— esculenta 1288
Morina coulteriana 704
Morus alba 702
——— serrata 702
Moschus moschiferus 300
Mota massyla 990
Motacilla alba .. 156, 630, 1166, 1206
——— beema 156
——— borealis 156
——— citreola 156
——— feldeggi 156
——— flava 1206
——— hodgsoni 545, 550
——— maderaspatensis 94, 165, 1166
——— melanope 160, 548, 1166, 1206, 1314, 1329, 1330
——— ocularis 651, 1206
——— personata 160, 550
Mudaria 898
——— cornifrons 898
Mungos ferrugineus .. 175, 836, 837
——— mungo .. 401, 822, 828, 836, 837, 848, 1183, 1359
——— pallipes 175
——— sanguinea 828
——— smithi 836
Munia atricapilla 673, 1205

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Munia oryzivora 1204
Muntiacus vaginalis 825
Murraya kœnigii.. 699
Mus 392, 845
—— albidiventris 406
—— albocinereus 1188
—— bachtrianus 1362
—— badius 823
—— beavanii 406
—— blanfordi 824
—— booduga 406, 842
—— decumanus 1175, 1176
—— dubius 841
—— flavescens 1175
—— fulvidiventris 406
—— gleadowii 176
—— golundi 407, 408
—— hirsutus 407, 408, 1175
—— homourus 841
—— kok 407
—— lanuginosus 406, 1175
—— lepidus 406, 1175
—— malabaricus 1191
—— manei ..772, 773, 1174, 1187, 1188
—— mettada 406, 1190
—— musculus .. 405, 406, 841, 1187, 1188
—— mutale 1175
—— myothrix 408
—— nilagiricus 823
—— oleraceus 823
—— phillipsi 772, 773, 849
—— platythrix 405
—— rattus 405, 614, 1189
—— ——— alexandrinus 1190
—— ——— tectorum 1190
—— rufescens 405
—— rufus 1175
—— saxicola 405, 406
—— spinulosus 405, 406
—— terricolor 406
—— urbanus 841
—— (Neotoma) giganteus 1191
—— (———) providens .. 407, 1175
Musa sapientum 146
—— superba 706

NUMBER.

Musca 1290
Musicapa 546
Mussænda erythrophylla 1364
———— frondosa 1364
Mustela erminea 653
——— whiteheadi 614, 653
Mycalesis anaxias 49
———— charaka 50
———— lepcha 50
———— malsara 50
———— malsarlda 50
———— mineus 50
———— nicotia 50
———— orseis.. 50
———— sanatana 50
———— visala.. 50
———— (Calysisme) ewansii .. 569
———— (————) intermedia .. 568
———— (————) mineus 568
———— (————) ——— polydecta .. 568
———— (————) perseoides .. 568
———— (————) ———— igilia. 568
———— (————) ———— khesia 558, 568
———— (————) ———— subdita. 568
———— (————) perseus .. 568
———— (————) rama 569
———— (————) visala 568
———— (————) ——— andamana. 569
———— (————) ——— ———— orcha. 558, 569
———— (Culapa) mnasicles perna .. 570
———— (Gareris) francisca sanatana. 568
———— (———) gomia 568
———— (Khabanda) malsarida .. 569
———— (Loesa) oroatis surkha .. 570
———— (Myrtilus) mystes 570
———— (Nissanga) patnia 569
———— (————) ——— junonia.. 569
———— (Orsotriæna) meda 570
———— (————) ——— mandata 570
———— (Pachama) mestra 569

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Mycalesis (Pachama) suavolens .. 569
——— (———) vetus 569
——— (Sodarga) gotama charaka .. 568
——— (Samanta) heri 569
——— (———) lepcha 569
——— (———) ———bethami .. 569
——— (———) ———davisonii .. 569
——— (———) ———watsoni 558, 569
——— (———) malsara 569
——— (———) mineus 569
——— (———) misenus 569
——— (———) nicotia 569
——— (———) ———nudgara .. 569
——— (Suralaya) nautilus 568
——— (———) orseis 568
——— (Telinga) adolphei 569
——— (———) oculus 569
——— (Virapa) adamsoni 568
——— (———) æmate 568
——— (———) anaxias 568
——— (———) ———manii .. 568
——— (———) ———radza .. 568
——— (———) anaxoides 568
Mycotheca brasiliensis 149
Myelois atrimaculalis 1255
Myiocopron orbiculare 1287
Myiophoneus eugenii 1199
——— temmincki . 545, 670, 682, 1304
Myosotis cæspitosa 704
——— sylvatica 704
Myotis 1321
——— parvipes 1179
Myriangium durieui 1295
Myristicivora bicolor 1214
Myrmecozela glebifera 126
——— leontina 126
——— metrophora 126
Myrsine africana 702, 1298
——— semiserrata 702
Myrtacea 1297
Myrtale 882
——— imitata 882
Mythimna implexa 888
——— viscosa 888

NUMBER.

Nacaduba ancyra 986
——— ardates 986
——— atrata 595, 986, 987
——— bhutea 595, 986
——— ——— kodi 986
——— cœlestis 595, 986
——— dana 595, 986
——— hampsoni 986
——— hermus 595, 986
——— kerriana 986
——— kurava 986, 987
——— macrophthalma .. 595, 986
——— nora 595, 986
——— noreia 595, 986
——— pavana 986
——— plumbeomicans 987
——— ——— nicobarica .. 987
——— prominens .. 595, 986, 987
——— sivoka 986
——— viola 986
Nacoleia conisota 1266
——— fuscifusalis 1265
——— leucosemalis 1266
——— megaspilalis 1267
——— ochrizonalis 1265
——— pachytornalis 1265
Naia bungarus .. 460, 1360, 1362, 1363
——— tripudians .. 141, 1103, 1337, 1360
Namangana 889
——— atrescens 890
——— cashmirensis 890
——— cretacea 889
——— pectinicornis 890
Nanina bajadera 708
——— lavipus 708
Nannorhops 72, 75, 76
——— ritchieana 72, 73, 74
Nasturtium palustre 703
Nauclea rotundifolia 1148
Nautilus kumagunensis 714
——— ———kuchensis .. 714
Nebrissa 435
——— bimacula 435, 443
Nectria alutacea 1293
——— asperata 1293

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Nectria bogoriensis 1293
——— bolbophylli 1293
——— calonectricola 1293
——— cinnabarina 1293
——— citri 1293
——— citricola 1293
——— coccidophtora 1293
——— collabens 1293
——— colletiæ 1293
——— diversispora 1293
——— flocculenta 1293
——— heterosperma 1293
——— hupocreoides 1295
——— Iriarteæ 1293
——— lætifulva 1293
——— luteoccinea 1293
——— melanommatis 1293
——— ochracea 1293
——— ochroleuca 1293
——— subcoccinea 1293
——— tjibodensis 1293
——— victoriæ 1293
——— xanthostigma 1293
Nelumbium speciosum 704
Nemorhædus bubalinus 246
Neocheritra amrita 996
——— fabronia 996
Neocosmospora vasinfecta 1295
Neolycæna sinensis 989
Neomelicharia furtiva 607, 609
Neomilichia 879
——— hylea 879
——— veprecola 879
Neomyrina hiemalis 996
Neophron ginginianus .. 98, 167, 1167
——— perenopterus 98, 618
Neopithecops zalmora 593, 981
Neorina hilda 54
——— (Hermianax) chrishna archaica 568
——— (———) patria westwoodi 568
——— (Neorina) hilda 568
Neotoma gigantea 1191
Nepeta campestris 703
——— ciliaris 703
Nephopteryx acrobasella 1253

NUMBER.

Nephopteryx ferreotincta 1254
——— nepheloalis 1253
——— rhodobasalis 1253
Nepticula polydoxa 107
——— sporadopa 108
Neptis anata 61
——— astola 61
——— cartica 61
——— guilta 61
——— miah 61
——— radha 61
——— soma 61
——— varmona 61
——— viraja 61
——— yerburii 61
——— (Andrapana) columella kankena 558, 577
——— (———) ——— khasiana 577
——— (———) ——— martabana 577
——— (———) ——— nilgirica. 577
——— (———) jumbah 578
——— (———) magadha 577
——— (Bimbisara) anjana 578
——— (———) cartica burmana .. 578
——— (———) ——— nashona .. 578
——— (———) ebusa 578
——— (———) ——— fuliginosa .. 578
——— (———) harita 578
——— (———) ——— nar .. 578
——— (———) sankara 578
——— (———) ——— guilta .. 577
——— (———) vikasi pseudovikasi 578
——— (Lasippa) heliodore 578
——— (Neptis) eurynomena 577
——— (———) hylas adara 577
——— (———) ——— andamana .. 577
——— (———) ——— astola 577
——— (———) ——— nicobarica .. 577
——— (———) ——— varmona .. 577
——— (———) mahendra 577
——— (———) mananda 577
——— (———) nata 577
——— (———) soma 577
——— (———) ——— clinia 577
——— (———) ——— hampsoni .. 577

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Neptis (Neptis) soma kallaura 577
——— (———) yerburii 577
——— (Rahinda) assamica 579
——— (———) aurelia 579
——— (———) cnacalis 579
——— (———) dindinga 579
——— (———) hordonia 578
——— (———) ——— sinuata .. 578
——— (———) peraka 579
——— (Stabrobates) ananta 578
——— (———) manasa .. 578, 1008
——— (———) melba 558, 578, 1008
——— (———) miah 578
——— (———) ——— nolana .. 578
——— (———) narayana 578, 1008
——— (———) ——— asterastilis 578
——— (———) ——— nana .. 578
——— (———) narcissina ..1008
——— (———) nyctea .. 578, 1008
——— (———) radha 578
——— (———) thisbe 578
——— (———) iriaja 578
——— (———) zaida 578
Nerium odorum 702
Nesocia bandicota 1163, 1191
——— bengalensis 407
Netta rufina 159, 181, 619
Nettion crecca 181, 633, 1088, 1163, 1169, 1220
——— formosum 1090, 1091, 1103, 1335
Nettopus coromandelianus. 103, 163, 1088, 1169, 1220
Neurosigma doubledayi 58, 574
——— ——— nonius 574
——— fraterna 574
——— siva 574
Nia tripudians 301
Nicara 896
——— castanea 896, 897
Niltava sundara 257, 628, 1203
Ninox scutulata 167, 1167, 1212
Niphanda cymbia 986
——— ———marcia 986
Noctua ambigua 438
——— conspicua 892

NUMBER.

Noctua clata 430
——— exigua 434
——— fibrosa 891
——— fulgens 434
——— histrionica 430
——— kadenii 440
——— leucostigma 891
——— litura 430
——— lunina 891
——— lupula 414
——— marginago 892
——— marginata 891
——— plantaginis 438
——— ravula 414
——— rejecta 906
——— rumicis 426
——— rutilago 892
——— tibialis 906
——— umbra 891
——— umbrago 892
Nodana discosticta 123
Nonagria 898
——— cyrnœa 903
——— gracilis 903
——— innocens 903
——— typhæ 898
——— uniformis 904
Noorda margaronialis 1269
Nopalea 1096
Nosophora mesosticta 1263
Notocelia 863
Notocrypta albifascia 1004
——— alysos 1004
——— basiflava 1004
——— chimaera 1004
——— clavata 1004
——— curvifascia 1004
——— feisthamelii .. 604, 1004
——— monteithii 1004
——— paralysos 1004
——— rectifascia 1004
——— restricta 605, 1004
——— singularis 1004
——— varians 1004
——— volux 1004

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Notopterus kapirat 693
Nucifraga multipunctata 548
Numenius arquata 157, 1217
——— phæops .. 157, 180, 1217
Nuripus cousimilis 574
——— ——— meridionalix 574
——— funebris 574
Nyceticorax griseus 1220
Nycticejus dormeri 398
——— isabellinus 1180
——— kuhli 398
——— tickelli 1180
Nycticorax griseus 169
Nyctinomus 1321
——— tragatus .. 831. 832, 1181
Nyctiornis athertoni 674, 1209
Nymphula grisealis 1261
Nyroca africana 181, 1088
——— baeri 1088, 1221
——— ferina 159, 181, 619, 1088
——— ferruginea .. 161, 619, 1221
——— fuligula 159

Ochna squarrosa 1231
Ochus subradiatus 1002
——— subvittatus 604, 1002
Odina decoratus 1000
——— ortygia 1000
——— wodier 1286
Odontodenia harrisi 1364
Odontoptilum angulata 998
——— pygela 998
——— sura 603, 998
Odontotermes brunneus 775, 781, 783, 784, 785, 786
——— ceylonicus 782, 783, 784, 786
——— feae 775, 786
——— horni .. 775, 782, 786, 787
——— obesus 775, 778, 779, 780, 781, 782, 783, 785, 788, 792, 793
——— ——— Wallonensis 775, 779, 786
——— obscuriceps 786

NUMBER.

Odontotermes redemanni .. 783, 786
Œdicnemus scolapax 101, 168, 1168, 1216
Œnopopelia tranquebarica 100, 168, 585, 586, 675, 1103, 1167, 1214
Oerane neæra 1004
Œthiopsar fuscus 1203
Oligodon 280
Oligomeris glaucescens 208
Oligostigma andreusialis 1261
——— chrysozonalis 1261
Ombrophila indica 1288
Omorphina 1226
——— aurantiaca 1226
Onchidium 708
Onobhrychis stewartii 1043
Ononis hircina 1051
Onryza meiktila 1005
Ophiobolus cajani 1296
——— manihotis 1296
——— porphyrogonus 1296
Ophiodothis sclerotica 1292
——— vorax 1292
Ophiusa lacteicincta 1224
——— rubida 1224
Opogona 113
——— cerodelta 112
——— dimidiatella 110
——— dramatica 110
——— elaitis 112
——— isoclina 111
——— orchestris 110
——— pandora 111
——— plasturga 112
——— protographa 112
——— semisulphurea .. 110, 111
——— sphaerotoma 111
——— stathmota 110, 111
——— xanthocrita 111
Opostega epistolaris 108
Oppelia 714, 1350, 1351
——— bicostata 714, 1352
——— glabella 1352
——— kutchensis 714
——— orientalis 714, 1352
——— trachynota 714

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Ops (Britomartis) cleoboides 995
— (Bullis) buto 995
— (——) valentia 995
— (Ops) melastigma 995
— (——) oeta 995
— (——) ogyges 995
Opsyra 909
——— chalcoela 909, 910
Opuntia sp. 1095
——— cochinelifera 1096
——— dillenii 1096, 1097
——— elatior 1096, 1097
——— ficus indica 1097
——— monacantha 1096, 1097
——— nigricans 1096, 1097
——— tuna 1097
Oraniella coffeicola 1281
Oreocincla dauma 630, 1204
——— ferrea 545, 629
——— ——— ferrea 629
——— ——— haringtoni 629
Oreinus richardsoni 619
Oreodoxa regia 355
Orinoma damaris 53, 562
Oriolus kundoo .. 92, 161, 1073, 1159, 1165
——— melanocephalus 677, 1159, 1165, 1202
——— tenuirostris 585, 586
——— traillii 676
Orneodes lyristis 107
——— panduris 106
Orsotricena meda 50
Orthogonia malayica 881
Orthomiella pontis 986
Orthopætus latita 997
——— lidderdali 997
——— phanæus 997
Orthosia uniformis 438
Orthotomus sutorius 91, 164, 1165, 1201, 1360
Oryza sativa 1293, 1297
Oryzopsis 1291
Osmorhiza claytoni 703
Osmotheron bicincta 1214
——— phayrei 1214
Otidea darjeelensis 1288

NUMBER.

Otis 21
—— aurita 722
—— bengalensis 1109
—— delicosa 1109
—— dybowskii 21, 24, 34
—— edwardsii 304
—— indica 722
—— macqueenii 325
—— marmorata 722
—— tarda 21, 22, 25, 40, 268, 301, 335
—— tetrax 22, 38, 41, 47, 303, 335, 738
Otocompsa emeria 671, 1200
——— flaviventris 585, 1200
——— fuscicaudata 1165
Otocorys elwesi 185
——— longirostris 1313
Otogyps calvus 167, 1167, 1212
Ovis ammon 179
—— aries 1359
—— vignei 301, 615, 1359
—— cycloceros 1066
Oxænanus 1232
——— brontesalis 1232
Oxalis corniculata 703
Oxytropis cachemirica 1042
——— lapponica 1042
——— meinshausenii 1042

Pachyura spp. .. 400, 834, 847, 1181
——— assamensis 847
——— etrusca 845
——— gracilis 845
——— hodgsoni 848
——— leucura 845
——— madagascariensis 845
——— nigra 1174, 1182
——— perrotteti .. 845, 847, 848
——— stoliczkana 847
Paduka andamanica 1003
——— glandulosa 1003
——— lebadea 1003
——— subfasciata 1003
Palæornis cyanocephalus 98, 166, 1167
——— fasciatus 1212

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Palæornis finschi 1212
——— indoburmanicus 1212
——— nepalensis .. 97, 166, 1167
——— schisticeps 1212
——— torquatus .. 97, 166, 1090, 1167, 1212
Pallinia grata 1291
Palma blanca 374
——— colorada 374
——— nigra 374
Pammene homotorna 874
——— peristictis 874
——— theristis 874
Pamphila avanti 1001
——— demea 1001
——— dieckmanni 1001
——— gemmatus 1001
Pandanus 84
——— furcatus 1296
Pandion haliætus .. 156, 182, 1212
Panicum 1291, 1294
——— sp. 1291
Panicum colonum 1291
——— italicum 1171
——— miliare 1171
——— spicatum 1171
Pantoporia cama 60
——— inara 60
——— kanwa 60
——— opalina 60
——— orientalis 60
——— ranga 60
——— selenophora 60
——— zeroca 60
——— (Athyma) perius 577
——— (Chendrana) pravara .. 577
——— (Condochates) opalina .. 577
——— (———) ——— orientalis.. 577
——— (Thironga) abiasa 577
——— (———) ranga 577
——— (Pantoporia) cama .. 576
——— (———) kresna .. 576
——— (———) nefte asita.. 576
——— (———) ——— inara.. 576

NUMBER.

Pantoporia (Pantoporia) nefte nivifera. 576
——— (———) ——— rufula.. 576
——— (———) selenophora. 576
——— (———) zeroca .. 576
——— (Parathyma) sulpitia .. 577
——— (Tacola) larymna 577
——— (Tacorafe) asura 577
——— (———) ——— idita .. 577
——— (Tatisia) kanwa 577
——— (Tharusia) jina 577
Papilio 1134, 1144
——— agamemnon .. 591, 763, 766
——— ——— decoratus 766
——— ——— ligatus 766
——— ——— salomomis 766
——— agenor 589
——— ——— alcanor 589
——— ——— bullerianus 589
——— agestor 589
——— aidoneus 589
——— alcibiades 590, 752
——— androcles.. 752
——— antierates 590
——— antiphates .. 590, 748, 752, 755
——— ——— alcibiades 752
——— arcturus 544, 590
——— aristeus 755
——— aristolochiæ .. 287, 530, 531, 588
——— arjuna 540
——— ascapaphus 527
——— astorion 589
——— axion 590
——— bathycles.. 587
——— bianor 544
——— blumei 742
——— buddha 541, 740, 741, 742, 743, 747
——— carpentéri 972
——— castor 589
——— chaon 589
——— chiron 591
——— cloanthus 591, 763
——— ——— sumatranus 763
——— clytia 531, 536, 589
——— ——— casyapa 532, 533
——— ——— commixtus 533

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Papilio clytia dissimilis .. 532, 533, 536, 589
——— flavelimbatus 533
——— lakeswara 533
——— papone 533
——— crino 740, 741, 742
——— daksha 521, 529, 530
——— danisepa 589
——— dasarada 589
——— deiphobus 527
——— deiphontes 527
——— deipylus 527
——— demetrius 972
——— demoleus 589, 742
——— dorcas 752
——— doson 755, 757, 758, 761, 762, 764, 765
——— dravidarum 752
——— elephenor 590
——— epaminonda 752
——— eurypylus 755, 358
——— ——— jason 752
——— evemon 758
——— ganesa 544
——— gyas 590
——— hector 287, 529, 530, 531, 533, 699
——— helenus .. 521, 525, 526, 527, 533, 589, 747
——— ——— daksha 517
——— isander 758
——— krishna 544, 590
——— maacki 544
——— mayo 527
——— memnon 527
——— mooreanus 521
——— nomius 749, 750, 751, 752, 756, 757
——— œnomaus 527
——— palinurus 742
——— ——— augustatus 742
——— ——— dœdalus 742
——— pamon 746
——— pandiyanus 530
——— parinda 527
——— paris 537, 538, 544, 590

NUMBER.

Papilio philoxenus 589, 1342
——— ——— polymitis 589
——— polyctor 544
——— polymnestor 518, 519, 520, 521, 527, 529, 530, 538, 744
——— polyphontes 531
——— polytes 287, 522, 527, 528, 529, 531, 538, 589, 699
——— ——— alcinder 531
——— ——— cyrus .. 527, 528, 531, 589
——— ——— polytes .. 527, 530, 531
——— ——— romulus 527, 529, 530, 531
——— procles 758
——— protentor 589
——— romulus 287, 699
——— rhesus 755
——— rhetenor 589
——— rumanzovius 527
——— sarpedon 591, 752, 758, 759
——— ——— semifasciatus 759
——— sikhimica 590
——— tamilana .. 538, 543, 544, 744, 745, 746
——— telearchus 589
——— telephus 755
——— teredon 759, 762, 763, 765
——— ——— anthedon 763
——— ——— choredon 763
——— ——— milon 763
——— ——— parsedon 763
——— triumphator 590
——— ——— mai 590
——— xenocles 591
——— (Achillides) arcturus 972
——— (———) ——— arius .. 972
——— (———) bianor gladiator .. 972
——— (———) buddha 973
——— (———) crino 973
——— (———) ——— fruhstorferi .. 973
——— (———) dialis schanus .. 972
——— (———) doddsi 972
——— (———) elephenor 972
——— (———) krishna 972
——— (———) montanus 973
——— (———) palinurus 973

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Papilio (Achillides) paris	972
—— (——) polyctor	972
—— (——) —— ganesa	972
—— (——) —— significans	972
—— (——) —— triumphator	972
—— (Byasa) adamsoni	970
—— (——) crassipes	970
—— (——) dasarada	970
—— (——) —— barata	970
—— (——) —— ravana	970
—— (——) lama	970
—— (——) latreillei	970, 972
—— (——) —— polla	970
—— (——) nevilli	970
—— (——) philoxenus	970
—— (——) —— polyeuctes	970
—— (——) plutonius pembertoni	970
—— (Cadugoides) agestor	970
—— (——) —— govindra	970
—— (——) epycides	970
—— (——) —— curiatius	970
—— (——) —— hypochra	970
—— (——) slateri	970
—— (——) —— marginata	970
—— (——) —— tavoyanus	970
—— (Charus) chaon	971
—— (——) —— ducenarius	971
—— (——) demolion	971
—— (——) —— liomedon	971
—— (——) fuscus andamanicus	971
—— (——) —— prexaspes	971
—— (——) helenus	971
—— (——) —— daksha	971
—— (——) —— mooreanus	971
—— (——) —— sakontala	971
—— (——) —— walkeri	971
—— (——) hipponous pitmani	971
—— (——) iswara	971
—— (——) noblei	971
—— (Chilasa) clytia	970
—— (——) —— casyapa	970
—— (——) —— commixtus	970
—— (——) —— dissimilis	970
—— (——) —— flavolimbatus	970
Papilio (Chilasa) clytia janus	970
—— (——) —— lankeswara	970
—— (——) —— onpape	970
—— (——) —— papone	970
—— (——) paradoxus danisepa	970
—— (——) —— telearchus	970
—— (Iliades) mayo	970
—— (——) memnon agenor	972
—— (——) polymnestor	972
—— (——) —— parinda	972
—— (——) protenor	972
—— (——) —— euprotenor	972
—— (——) rhetenor	972
—— (——) —— leucocelis	972
—— (Laertias) polytes	558, 971, 972
—— (——) —— aristolochiæ	972
—— (——) —— cyrus	972
—— (——) —— hector	972
—— (——) —— nikobarus	972
—— (——) —— romulus	972
—— (——) —— sakontala	972
—— (——) —— stichioides	558, 972
—— (——) —— stichius	972
—— (——) —— walkeri	972
—— (Losaria) coon	970
—— (——) —— cacharensis	970
—— (——) —— doubledayi	970
—— (——) —— sambilanga	970
—— (——) rhodifer	970
—— (Meandrusa) gyas	973
—— (——) —— aribbas	973
—— (——) payeni amphis	973
—— (——) —— evan	973
—— (Menelaides) aristolochiæ	969
—— (——) —— camorta	970
—— (——) —— ceylonicus	970
—— (——) —— goniopeltis	970
—— (——) hector	969
—— (——) jophon	969
—— (Mimbyassa) bootes	972
—— (——) janaka	972
—— (Ornithoptera) acacus	969

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Papilio (Ornithoptera) darsius 969
——— (————) helena cerberus. 969
——— (————) ——— helia .. 969
——— (————) minos 969
——— (Pangerana) aidoneus .. 969
——— (————) varuna astorion .. 969
——— (————) zaleucus 969
——— (Papilio) demoleus 971
——— (———) ——— malayanus .. 971
——— (———) machaon asiatica .. 971
——— (———) ——— ladakensis .. 971
——— (———) ——— sikkimensis .. 971
——— (———) ——— sphyrus .. 971
——— (———) ——— verityi .. 971
——— (———) xuthus 971
——— (Paranticopsis) macareus gyndes 974
——— (————) ——— indicus 974
——— (————) ——— lioneli 974
——— (————) megarus .. 974
——— (————) ——— similis 974
——— (————) xenocles .. 974
——— (————) ——— kephisos 974
——— (————) ——— phrontis 974
——— (Pathysa) agetes 973
——— (———) alcibiades 973
——— (———) antiphates 973
——— (———) ——— ceylonicus 973
——— (———) ——— epaminondas .. 973
——— (———) ——— naira .. 973
——— (———) ——— pompilius 973
——— (———) aristeus anticrates .. 973
——— (———) ——— hermocrates. 973
——— (———) eurous cashmirensis. 973
——— (———) ——— sikhimica .. 973
——— (———) glycerion 973
——— (———) nomius 973
——— (———) ——— swinhoei .. 973
——— (Tamera) castor 971
——— (———) ——— mehala .. 971
——— (———) ——— polias 971
——— (———) dravidarum 971
——— (———) mahadeva 971
——— (Zetides) acheron 973

NUMBER.

Papilio (Zetides) agamemnon 973
——— (———) ——— andamana .. 973
——— (———) ——— decoratus 973
——— (———) ——— menides 973
——— (———) bathycles chiron .. 973
——— (———) cloanthus 973
——— (———) doson 973
——— (———) ——— axion 973
——— (———) ——— eleius 973
——— (———) eurypylus cheronus .. 973
——— (———) ——— macronius. 973
——— (———) jason 973
——— (———) sarpedon 973
——— (———) ——— teredon .. 973
Paracaryum glochidiatum 704
Paradoxurus nictitans 1184
——— niger 301, 1184
——— pennanti 1184
——— typus 1184
Paramigyna monophylla 527
Paranthostomella capparidis 1296
Parantinhœa marshallii 570
Pararge (Chonala) masoni 562
——— (Lasiommata) maera schakra .. 562
——— (————) mæroides .. 562
——— (————) menava 562
——— mœrula 562
——— (Pararge) eversmanni cashmirensis. 562
Pareba vesta 64, 584
Pareronia 1131, 1134, 1140, 1142, 1143, 1144, 1141
——— avatar 593, 981
——— ——— paravatar 981
——— ceylonica 981
——— fraterna 981
——— hippia 1140
——— pingasa 981, 1140
——— ——— naraka 985
——— spicrlifera 981
——— valeria hippia 981
——— ——— livilla 981

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Parhestina mena nicevillei ..	.. 573
——— persimilis	57, 573
——— ——— zella ..	.. 573
Pariambia aprepes	.. 417
——— pulla	.. 417
——— unduligera	.. 417
Parnara assamensis	.. 605
——— bevani	.. 605
——— contigua	.. 605
——— eltola	.. 605
——— guttata	.. 605
——— kumara	.. 605
——— oceia	.. 605
——— pagana	.. 605
——— sinensis	.. 605
——— (Baoris) farri	..1005
——— (———) occia	..1005
——— (———) penicillata ..	..1005
——— (———) scopulifera ..	..1005
——— (———) sikkima ..	..1005
——— (———) unicolor ..	..1005
——— (Chapra) agna	..1006
——— (———) balaramaella	..1006
——— (———) brunnea ..	..1006
——— (———) chaya ..	..1006
——— (———) cœra ..	..1006
——— (———) julianus ..	..1006
——— (———) larika ..	..1006
——— (———) mathias ..	..1006
——— (———) midea ..	..1006
——— (———) prominens ..	..1006
——— (———) similis ..	..1006
——— (———) sinensis ..	..1006
——— (———) sodalis ..	..1006
——— (———) subochracea ..	..1006
——— (———) thrax ..	..1006
——— (Milena) mormo ..	..1005
——— (———) plebeia ..	..1005
——— (Parnara) abica ..	..1006
——— (———) alie	..1006
——— (———) assamensis	..1006
——— (———) aurociliata	..1006
——— (———) austeni ..	..1006
——— (———) bada ..	..1006
——— (———) bevani ..	..1006

	Number.
Parnara (Parnara) cahira ..	..1006
——— (———) canaraica ..	..1006
——— (———) ciingala ..	..1006
——— (———) celaca ..	..1006
——— (———) conjuncta	..1006
——— (———) contigua ..	..1006
——— (———) davida ..	..1006
——— (———) discreta ..	..1006
——— (———) eltola ..	..1006
——— (———) flexilis ..	..1006
——— (———) fortunei ..	..1006
——— (———) guttatus ..	..1006
——— (———) haga ..	..1006
——— (———) intermedia	..1006
——— (———) javana ..	..1006
——— (———) jolando ..	..1006
——— (———) kolantus ..	..1006
——— (———) kumara ..	..1006
——— (———) mangala ..	..1006
——— (———) moolata ..	..1006
——— (———) nandoa ..	..1006
——— (———) narooa ..	..1006
——— (———) onchisa ..	..1006
——— (———) pagana ..	..1006
——— (———) pellucida ..	..1006
——— (———) philippina	..1006
——— (———) philotas ..	..1006
——— (———) saruna ..	..1006
——— (———) scortea ..	..1006
——— (———) seriata ..	..1006
——— (———) sifa ..	..1006
——— (———) thyone ..	..1006
——— (———) toona ..	..1006
——— (———) tulsi ..	..1006
——— (———) una ..	..1006
——— (———) urejus ..	..1006
——— (———) wambo ..	..1006
Parnassius stubbendorfi tartarus	.. 974
——— (Kailasius) charltonius	.. 974
——— (———) imperator augustus	.. 974
——— (Koramius) delphius atkinsoni.	974
——— (———) ——— chitralica.	974

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Parnassius (Koramius) delphius lampidius. 974
——— (———) ——— stenosemus. 974
——— (———) ——— stoliczanus. 974
——— (———) hunza, ... 974
——— (———) whitei, ... 974
——— (Parnassius) epaphus, .. 974
——— (———) ——— sikkimensis. 974
——— (———) hardwickii, .. 974
——— (———) ——— viridicans, 974
——— (———) himalayensis. .. 974
——— (———) jacquemontii .. 974
——— (———) ——— chitralensis 974
——— (———) ——— impunctata, 974
——— (Tadumia) acco 974
——— (———) ——— gemmifer . 974
——— (———) mœlleri .. 974
——— (———) simo 974
——— (———) acconus .. 974
Parodiella perisporioides 1285
Parthenos gambrisius 59, 576
——— ——— apicalis .. 576
——— ——— cyaneus .. 576
——— ——— virens 576
Parus atriceps 163, 1198
——— monticola 262, 621
Paspalum scrobiculatum 1285
Passer cinnamomeus .. 185, 552, 1205
——— domesticus .. 94, 165, 185, 552, 618, 1166, 1205, 1311
——— hispaniolensis 552
——— montanus 618, 630
——— pyrrhonotus 1073
Pastor roseus 155, 552, 1165
Patella aster 637, 638, 639
——— capensis 638
——— novemradiata 638
——— rota 638
——— vulgata 639

NUMBER.

Patellaria carteri 1289
Patorius erminea 61
Pavo cristatus .. 100, 168, 1082, 1168
——— muticus 1214
Pavoncella pugnax 158
Pedestes masuriensis 1002
——— pandita 604, 1002
——— sala 1002
——— submaculata 1002
Pedicularis gracilis 206
——— pectinatas 206
——— porrects 206
——— tennirostris 206
Peganum harmala 228
Pelargopsis amauroptera 1209
——— gurial .. 96, 166, 1204
Pelecanus philippensis 163, 1218
Pellorneum minus 1199
Pelomys watsoni 407, 408
——— subochraceum 670, 1199
Peltoceras athleta .. 714, 1351, 1352
——— bidens 1351, 1352
Pentapetes phœnicea 226, 1027
Penthema binghami 580
——— darlisa 580
——— lisarda 63, 580
Penthoceryx sonnerati 1211
Perdicula argunda 100, 168
——— asiatica 100, 168
Perdix hodgsoniæ 179, 181
Pericrocotus brevirostris 160, 628, 1161
——— erythropygius 92, 164, 1165
——— fraterculus .. 672, 1202
——— peregrinus. 92, 164, 1165, 1202
——— speciosus 1161, 1165
Perigea 882
——— albomaculata 882, 884
——— apameoides 889
——— atricuprea 882, 884
——— canorufa 886
——— capensis 888, 885
——— centralis 888
——— chinensis 888
——— contigua 882, 883
——— dolerosa 883, 885

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Perigea galaxia 883, 885
——— illecta 886
——— inexacta 886
——— leprosa 882, 883
——— leucospila 882, 884
——— meleagris 886
——— spicea 882, 883, 886
——— stellata 882
——— tricycla 881
Perigeodes 879
——— magna 880, 881
——— malayica 880, 881
——— poliomera 880
——— rectivitta .. 879, 880, 882
——— tricycla 880, 881
——— ——— fuscostrigata .. 881
Perisphinctes alterneplicatus .. 715, 1352
——— anceps 715
——— angygaster 1349, 1351, 1352
——— bathyplocus 715
——— chloroolithicus 1352
——— curvicosta .. 1349, 1351
——— dhoscensis .. 715, 1349, 1351
——— euplocus 1352
——— frequens 715, 1352
——— hians 1351
——— indogermanus 1352
——— jooraensis 1352
——— katrolensis .. 715, 1350
——— leiocymon 1352
——— martelli 715
——— omphalodes .. 715, 1351
——— orion 1352
——— paramorphus .. 715, 1352
——— plicatilis 1352
——— pottingeri .. 715, 1350
——— præcursor 1352
——— rehmanni.. 1351
——— rota 1349, 1352
——— sparsiplicatus .. 1351, 1352
——— spirorbis 1352
——— torquatus .. 715, 1350
——— virguloides 715
Peristeria elata 1361
Peristylus 171

NUMBER.

Peristylus goodyeroides var. affinis 172, 173
——— lawii 172, 174
——— plantagineus 172, 173
——— spiralis.. 172
——— stocksii 172
Pernis cristatus 167, 1167
Peroneutypella ambiens 1298
——— indica 1298
——— pusilla 1298
Petaurista cinderiella 301
——— inornatus 1362
——— oral 822
——— philippensis.. 822
Petrophila cyanus .. 160, 1204, 1328
——— erythrogastra .. 257, 673
Peucedanum graveolens 1057
——— thomsoni 1057
Peziza æruginea 1289
——— aluticolor 152
——— epispartia 1288
——— hainesii 152
——— lachnoderma 152
——— semitosta.. 152
Phacidium symplocinum 1289
Phægorista catocalina 908
——— catocaloides 909
Phæopezia orientalis 1289
Phagytra 1229
——— abactalis 1229
——— leucogastralis 1229
Phalacra 444
——— gemella 444
Phalacrocorax corbo 170, 1218
——— fuscicollis 1168
——— javanicus. 102, 163, 1160
1168, 1218
Phalera diversa 1271
Pharetra 425
——— auricoma 425
Phaseolus calcaratus 1050
——— max 1171
——— mungo .. 698, 1050, 1171
——— ——— radiatus 1297
——— radiatus 698
Phasianus humiæ 632

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Phasinoxena metaleuca	1249
Phengaris atroguttata	594
Pheretima posthuma	289
——— (Perichæta) posthuma	291
Philadelphus coronarius	702
Philanthus dissectus	813
——— emarginatus	802
——— interstinctus	813
Philorgyia	425
——— luteicoma	425
Phlebotomus babu	620
——— pappatasii	620
Phoenicopterus roseus	170
Phœnix	1286
——— humilis	380
——— sylvestris	953
Pholidocarpus	915
Pholidotus bengalensis	844
Photoscotosia venipicta	1245
Phragmatiphila	898
——— fumea	898
——— grisescens	898, 899
——— leucaneura	898
——— nexa	898
Phryganodes stygialis	1264
Phycita melanosticta	1255
——— mimella	1255
——— umbratalis	1255
Phyllachora abyssinica	1290
——— annulata	1290
——— aspidea	1290
——— bischofiae	1291
——— chionachnes	1291
——— coicis	1291
——— cynodontis	1291
——— cyperi donacis	1291
——— dalbergiae	1291
——— demersa	1290
——— desmodii	1291
——— dolichospora	1291
——— erebia	1291
——— ficuum	1290
——— fimbristylicola	1291
——— graminis	1291
——— infectoriae	1290
Phyllachory malabrensis	1292
——— marmorata	1290
——— musae	1290
——— permixta	1291
——— pongamiae	1291
——— repens	1290
——— rottboelliae	1292
——— rhytismoides	1290
——— shiraina	1292
——— spissa	1292
——— tenuis	1291
——— topographica	1290
——— transiens	1291
——— viventis	1291
Phyllanthus niruri	219
——— simplex	219
——— urinaria	218
Phylloceras	1350
——— disputabile	714
——— lodaiense	714
——— mediterraneum	714
Phylloscopus affinis	184, 548
——— humii	160
——— indicus	155
——— proregulus	1305
——— tickelli	155
——— tristris	155
Phyrulla aurantiaca	1306, 1308
Physalis minima	704
Physalospora agaves	1299
——— bambusæ	1295
——— calami	1295
——— transversalis	1295
——— ventricosa	1295
——— xanthocephala	1295
Pica bottannensis	184
Picea morinda	142, 705
Pieris	1133, 1135, 1144, 1145
——— brassicæ	591, 1135
——— canidia	592, 1135
——— glauconome	1135
——— kreuperi desta	620
——— melete	592
——— naganum	592
——— ovalifolia	1290

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Pieris (Anthocaris) lucilla 977
—— (Parapieris) callidice 976
—— (————) ———— kalora .. 976
—— (————) chumbiensis .. 976
—— (Pieris) brassicæ 976
—— (————) canidia 976
—— (————) ———— canis .. 559, 976
—— (————) deota 976
—— (————) krueperi devata .. 976
—— (————) melete 976
—— (————) ———— ajaka 976
—— (————) ———— melaina .. 976
—— (————) montana 976
—— (————) naganum 976
—— (————) napi 976
—— (————) rapae 976
—— (Pontia) daplidice 976
—— (————) ———— moorei .. 976
—— (————) glauconome 977
—— Synchloe belia daphalis 977
—— ———— chloridice 977
Pilipectus 1233
———— cyclopis 1234
———— ocellata 1233, 1234
Pimpinella acuminata 703, 1055
———— diversifolia 1055
———— saxifraga 1055
Pinus 1288
—— excelsa 705, 1076, 1077, 1078, 1288
—— longifolia 705
Piper betle 229
—— niger 1293, 1285, 1293
—— nigrum 1297
Pipistrellus 1321
———— ceylonicus 397, 821, 330, 1179
———— coromandra 1179
———— dormeri ..398, 821, 830, 1179
———— mimus ..398, 769, 821, 1180
———— ———— glaucillus 769
Piprisoma squalidum 95, 166
Pirdana distanti.. 1003
———— hyela 1003
———— ———— rudolphii 1003
———— pavona 1003
Pisonia excelsa 294

NUMBER.

Pithauria sitchisonii 1004
———— glauca 1004
———— murdava 604, 1004
———— stramincipennis .. 604, 1004
Pithecops fulgens 981
———— hylax 593, 981
Pitta brachyura 1345
—— cucullata 586
—— cyanea 1207
—— cyanoptera 1207
—— nepalensis 1207
Plastingia callineura 1003
———— corissa 1003
———— drancus 1003
———— idyalis 1003
———— indrasana 1003
———— latonia 1003
———— margherita 604, 1003
———— naga 1003
———— noemi 1003
———— tessellata 1003
Platalea leucorodia .. 102, 169, 1219
Platanthera 171, 1129
———— susannæ 1129
Platanus orientalis 705
Plataplecta 425
———— primosa 425
Platyachista pallasii 1184
Platystemma violoides 704
Plecotus 1321
Plectranthus gerardianus 704
Plegadis falcinellus 163
Pleogibberella calamia 1294
Pleomassaria ilicina 1296
Pleospora spinerum 1296
Plesiosaurus 465
Pleuromya 1351
Pleurospermum angelicoides 1057
———— brunonis 1057
———— candolii 1057
———— densiflorum 1057
———— govanianum 1056
———— stylosum 1057
Ploceus baya .. 93, 165, 675, 1073, 1204
—— manyar 1204

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Ploceus passerinus 1360
Plotus melanogaster 102, 163, 1168, 1219
Plumbago zeylanica 212
Plusia chalcopasta 1225
——— exquisita 1224
——— megaloba 1225
Pnoepyga 1201
Podiceps albipennis .. 103, 169, 275, 663, 1169, 1221
Podocarpus 1298
Podophyllum emodi 702
Pœcilia 411
——— muralis 411
Pœonia emodi 703
Pogonatherum saccharoideum 1291
Poinciana regia 699
Polia soluta 426
Polioaëtus ichthyaëtus 167, 1213
Polyacha depressella 1251
Polyalthia longifolia 755, 766
Polychrosis cellifera 869
Polydesma noduna 1227
Polygala chinensis 704
——— crotalaroides 704
——— triphylla 704
Polygonum alatum 216
——— alpinum 216
——— barbatum 214
——— flaccidum 215
——— glabrum 213
——— glaciale 215
——— hydropiper 215
——— lapathifolium 214
——— minus 214
——— orientale 212
——— persicaria 214
——— polystachyum 216
——— sagittatum 216
——— sibiricum 217
——— simlense 214
——— stagninum 214
——— strigosum 216
——— tortuosum 216
——— virginianum 213
Polyocha saccharella 1251

NUMBER.

Polyommatus bœticus .. 287, 289, 596, 987
Polyphænis 418
——— confecta 418, 419
——— diminuta 418, 419
——— indica 419
——— inepta 419
——— largetani 418
——— pulcherrima 418
Polypectrum chinquis 632, 1214
Polyporus cubensis 148
——— gilvus 148
——— grammocephalus 149
——— isidioides 148
——— lepideus 149
——— persoonii 148
——— umbilicatus 149
Polystictus crassipes 150
——— cupreonitens 150
——— floridanus 149
——— gibberulosum 149
——— katui 150
——— leoninus 149
——— occidentalis 149
——— ——— resupinata .. 149
——— russogramme 149
——— sanguineus 149
——— sarawacensis 150
——— senex ? 150
——— xanthopus 149
——— zeylanicus 149
——— zonatus 149
Polystigma fulvum 1292
——— ochraceum 1292
Pomasia punctaria 1245
Pomatorhinus hypoleucus 1198
——— imberbis 670
——— macclellandi 624
——— nuchalis .. 261, 659, 670, 1085, 1086
——— ruficollis 623
——— schisticeps 1198
Pongamia glabra 1289, 1291
Pontedera 916
Poocephalus moniliformis 472
Poozana 1215

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Populus ciliata .. 702, 1284, 1293, 1297
Poritia geta 597
——— hewitsoni 699
——— (Poiritia) erycinoides 987
——— (———) geta 986
——— (———) hewitsoni, ... 987
——— (———) ——— tavoyana,.. 987
——— (———) phraatica, ... 987
——— (———) pleurata 987
——— (———) sumatræ 987
——— (Simiskina) harterti 987
——— (———) pediada 987
——— (———) phalia 987
——— (———) phalena 987
Poronia arenaria 1300
——— heliscus 1300
——— oedispus.. .. .. 1280, 1300
——— polyporoides 1300
Porphyrio poliocephalus .. 169, 1215
Portulaca oleracea 209
Parzana maruetta 157
——— pusilla 157
Potentilla albifolia 703, 1052
——— argentea 1054
——— argyrophylla 1035
——— clarkei 1053
——— fulgens 1052
——— kashmirica 1054
——— nepalensis 703, 1054
——— sericea 1053
Pothos scandens 1287
Prangos pabularia 1056
Pratincola caprata .. 93, 165, 617, 672, 1165, 1204
——— maur .. 160, 545, 617, 1165, 1204
Prenanthes violœfolia 704
Presbytis anchises 397
——— entellus ..230, 397, 820, 821, 845, 1159
——— hypoleucos 821, 1176
——— leucopus 821
Primula denticulata 702
——— floribunda 702
Prinia blanfordi 1202
——— flaviventris 1201

NUMBER.

Prinia inornata .. 91, 164, 1165, 1202
——— socialis 91, 164
——— sylvatica 91, 164, 1165
Prioneris .. 752, 1132, 1135, 1142, 1143, 1144, 1145
——— antiphates 1153
——— clemanthe .. 591, 975, 1153
——— doson 1153
——— sita .. 975, 1135, 1151, 1153
——— thestylis .. 591, 975, 1153
——— ——— jugurtha 975
Pritchardia 357, 359
——— filamentosa .. 361, 362, 364
——— filifera 361, 362
——— grandis 85
——— pacifica 358, 359
Prodenia 430
——— androgea 430
——— apertura 433
——— bipars 433
——— ciligera.. 431
——— declinata 431
——— evanesceous 431
——— glaucistriga 431
——— ingloria 433
——— litura 430
——— reclusa.. 893
——— subterminalis 431
——— synstictis 433
——— tasmanica 431
——— testaceoides 431
Promachus sp. 610
——— yessonicus 610
Propassers pulcherrimus 185
Proraphora 1252
——— curvibasella.. 1252
——— dialeuca 1252
Prospalta 882
——— contigua 883
——— leucospila 882
——— stellata 883
Prothoe (Agatara) calydonia belisama. 580
——— (Prothoe) francki 580
——— (———) ——— regalis .. 580
Protoseudyra 909

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Protoseudyra picta 909
Proxenus 445
——— dissimilis 445
——— hospes 445
——— tristis 446
——— ab. lugens 446
Prunus amygdalus 702
——— armeniaca 1293
——— cerasus 702
——— padus 1292
——— puddum 702
Prytaneutis, gen. nov... 109
——— clavigera.. 109
Psammodynastes pulverulentus .. 686
Psammogeton biternatum 1058
Psammophis schokari 634, 635
——— triticeus 634, 635
Psarisomns dalhousiæ 1208
Pseudergolis wedah 64, 583
Pseudocerastes persicus 1340
Pseudogyps bengalensis .. 98, 167, 1160, 1167, 1213
Pseudopeziza medicaginis 1288
——— repanda 1289
——— trifolii 1289
Pseudophacidium indicum 1289
Pseudopunda 425
——— bicolor 425
Pseudotantalus leucocephalus .. 102, 169, 1168, 1219
Pseudoxenodon 1012
Psoralea corylifolia 224
Pterocles fasciatus 100, 168
Pteroclurus exustns .. 100, 162, 1106
Pteromys candidulus 1102
——— oral 882
Pteropus 1321
——— assamensis 821
——— edwardsi 821
——— giganteus ..821, 829, 847, 1177
——— kelaarti 821
——— leucocephalus 821
——— marginatus 846
——— medius 821
——— pusillus 846

NUMBER.

Ptyonoprogne concolor 94, 165
——— rupestris.. .. 618, 660
Pucrasia macrolopha 1362
Pudicitia pholus.. 1003
Punicea granatum 702
Pycnocycla glauca 1056
Pycnonotus blanfordi 1200
——— pygœus 250
Pycnorhampus icteroides 547
Pyctorhis sinensis .. 89, 164, 1164, 1199
Pyrausta metasialis 1269
——— microdontalis.. 1270
——— monosema 1270
Pyromys 340, 770
Pyrops candelaria 609
Pyrrhia 891
——— aconiti 892
——— angulata 892
——— purpurina 891
——— umbra 891
Pyrrhocorax graculus 183
Pyrrhula aurantiaca 546, 1362
Pyrrhulanda grisea .. 95, 162, 1166
Pyrus baccata 702
——— pashia 621, 702
Pythium palmivorum 951
Python 447, 448
——— amethystinus 447
——— anchictæ.. 447
——— curtus 447
——— molurus .. 277, 447, 451, 452, 453, 460, 461, 474
——— regius 447, 467
——— reticulatus .. 447, 451, 452, 453
——— sebæ 447, 453
——— spilotes 447
——— timorensis 447

Quercus dilatata.. 287
——— genestrata 287
——— incana 287
——— lamellosa 287
——— lineata 287

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Quercus pachyphylla	287
——— spicata	287
Querquedecula circia	159, 181, 1088, 1221, 1360
Rabila	900
——— frontalis	900
Radinacra	893
——— cinerascens	893
——— placida	441
——— thoracica	893
Radinogœs	445, 446
——— tenuis	445
Rahinda hordonia	61
Rallina	1215
Rana tigrina	8, 687, 1341
Ranunculus arvensis	227
——— diffusus	705
——— hirtellus	227, 703
——— lætus	227
——— sceleratus	227
Rapala abnormis	994
——— barthema	994
——— buxaria	602, 994
——— damona	994
——— deliochus	994
——— dieneces	994
——— francesia	994
——— grisea	994
——— jarbas	603, 994
——— lankana	994
——— lazulina	994
——— maculata	994
——— melampus	994
——— nicevillei	994
——— nissa	602, 994
——— orseis	994
——— petosiris	994
——— ranta	994
——— rectivitta	994
——— refulgens	994
——— rosacea	994
——— schistacea	602, 994

	Number.
Rapala scintilla	994
——— sphinx	994
——— subjuttata	994
——— subpurpurea	994
——— saffusa	994
——— tara	994
——— testa	994
——— varuna	602, 994
——— ——— rogersi	994
——— xenophon	603, 994
——— ——— intermedia	994
Raparna digramma	1231
Rathinda amor	997
Ratufa gigantea	1102
——— indica	1185
Recurirrostris avocetta	180
Regadia crisilda	566
——— crito	566
——— critolaus	566
Regulus cristatus	1305
Rehimena phrynealis	1263
Rehmiomyces profusus	1297
Reinwardzia trigyna	221, 703
Reseda pruinosa	208, 227
Reticularia venosa	146
Rhabdops bicolor	686
Rhapalocampta benjamini	606
Rhaphicera moorei	562
——— satricus	53, 562
Rhapis acaulis	379
Rhinolophus	1321
——— affinis	1178, 1359
——— cinerascens	1178
——— dukhunensis	1178
——— fulgens	829
——— murinus	829
——— petersi	1178
——— remmanika	1178
——— rouxi	1178
——— rubidus	1178
Rhinopalpa polynice	63
——— ——— birmana	580
Rhinopoma	1321
——— cordofanicum	768
——— cystops	769

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Rhinopoma hardwickii .. 767, 768, 769, 831, 1181
——— kinneari .. 767, 768, 831, 847
——— lepsianum 768
——— microphyllum 767, 768, 831
——— muscatellum .. 767, 769
——— sumatræ 767, 768
Rhipicephalus sanguineus .. 694, 695
Rhipidura albicollis .. 628, 672, 1203
——— albifrontata .. 92, 165, 672, 1165
——— pectoralis 93, 169
Rhizina reticulata 1288
——— zonata 1288
Rhododendron 1245
——— campanulatum 703
Rhopalocampta benjaminii 1007
——— crawfurdi 1007
——— electra 1007
Rhopobota 855
Rhropodytes tristis 674, 1212
Rhus punjabensis 703
Rhyacornis fuliginosus .. 184, 262, 545, 1204, 1306
Rhynchina leucogonia 1236
Rhynchops albicollis 170, 1218
Rhynchosia himalensis 705
Rhytidoceros undulatus.. 1210
Rhytisma acerinum 1290
——— conoideum 1289
——— durissimum 1289
——— fuscum 1289
——— himalense 1290
——— piceum 1290
——— pieridis 1290
——— ustulatum 1289
Ribes nigrum 703
——— rubrum 703
Ricinus communis .. 1094, 1288, 1295
Ritra aurea 996
Rivula basalis 1242
——— cognata 1241, 1242
——— magniplaga 1229
——— procrita 1242
——— simulatrix 1242
Robillarda 146

NUMBER.

Robillarda scutata 147
Rosa 1296
macrophylla 703
sericea 703
Rosellinia andurnensis 1297
——— bunodes 1297
——— echinata 1297
——— mangiferæ 1297
——— picacea 1297
——— picta 1297
Rostratula capensis .. 102, 168, 666, 667, 1218
Rottboellia exaltata 1292
Rubus clarkei 1035
——— macilentus 702
——— niveus 702
Rumex acetosa 218, 1029
——— hastatus 218, 1028
——— nepalensis 218
——— vesicarius 218
Ruralis 988
Rusa unicolor 1193
Ruticilla frontalis 548
——— phænicurus 548
——— rufiventris .. 160. 184, 548

Sabal 376
——— adansoni 378, 380, 389
——— blackburniana 389, 391
——— caroliniana 379
——— giesbreghtii 387
——— glabra 379
——— glaucescens 387
——— mauritiæformis 83, 387
——— minima 379
——— minor 379
——— mocini 389
——— palmetto 382, 386, 389
——— pumila 379
——— serrulata 376
——— taurina 379
——— umbraculifera 382, 387
Saccharum 1286

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Saccharum officinarum	1292, 1296
——— spontaneum	1291
Saccobolus kerverni	1289
Saccopetalum tomentosum	755, 758, 766
Salamandriæ	145
Saletara panda chrysea	978
Saluria hemiphæalis	1251
Salurnis marginellus	607, 608, 609
Salvia glutinosa	703, 704
——— lanata	703
Sancus forensis	1001
——— kethra	1001
——— pulligo	604, 1001
——— subfasciata	1001
——— ulunda	1001
Santalum album	1286
Sapheneutis galerita	127
——— metacentra	127
Sapindacea	1290
Sarangesa albicilia	1000
——— dasahara	603, 1000
——— purendra	1000
——— sati	1000
——— sezendis	1000
Sarcidiornis melanotus	103, 163, 685, 1088, 1103, 1220
Sarciophorus malabaricus	102, 168
Sarcogrammus atrinuchalis	1217
——— indicus	101, 168, 1168
Sarcoscypha sp.	151
——— colensoi	152
——— melanopora	152
——— racoitzæ	151
Sarcosoma mœlleri	1279
Saribus	346
——— hoogendorpii	356
——— olivæformis	355
——— rotundifolia	349, 350
——— subglobosa	349
Sasia ochracea	1208
Satarupa bhagava	1000
——— ——— andamanica	1000
——— cognata	1000
——— corinna	1000
——— diversa	1000
Satarupa gopala	1000
——— narada	1000
——— niphetes	1000
——— phisara	603, 1000
——— sambara	1000
——— ——— affinis	1000
——— ——— dohertyi	1000
Satsuma leechii	989
Satyrus (Aulocera) brahminus	562
——— (———) loha	563
——— (———) ——— chumbica	563
——— (———) padma	562
——— (———) saraswati	563
——— (———) sibyllina brahminoides	562
——— (———) swaha	562
——— (Eumenis) enewata	563
——— (———) mniszechii baldiva	563
——— (———) ——— lehana	563
——— (———) thelephassa	563
——— (Karanasa) actæa pimpla	563
——— (———) cadesia	563
——— (———) diffusa	563
——— (———) digna	563
——— (———) hübneri	563
——— (———) ——— moorei	558, 563
——— (———) leechi	563
——— (———) modesta	563
——— (———) semele	563
Satyrus (Nytha) macropthalma	563
——— (———) parisatis	563
——— (Paræneis) palæarcticus sikkimensis	562
——— (———) pumilus	562
——— (———) ——— bicolor	562
——— (Philarcta) hanifa	563
——— (———) heydenreichi shandura	563
——— (———) persephone	563
Sauropatis chloris	294, 1210
Saxicola deserti	155
——— isabellina	155
——— montana	184
——— opistholeuca	155
——— picata	160

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Saxifraga ciliata 704
——— filicaulis 704
Scabiosa olivieri 204
——— speciosa 204
Scandix pecten-veneris 1056
Schima wallichii 1291
Schizodactylus monstruosus 1091
Schizophyllum alneum 151
Schizothorax esocinus 285
Schizothyrium annuliforme 1289
Scirrhia seriata 1292
Sciuropterus, sp. 31
——— alboniger 1362
——— fimbriatus .. 614, 1362
Sciurus bombayannus 1185
——— elphinstonei 1185
——— erythræus 1102
——— indicus 1185
——— palmarum .. 403, 404, 822, 823
——— penicillatus 822
——— purpureus 1185
——— stevensi 1102
——— tristriatus 1186
——— (Tamias) dussumieri 1186
Scobura cephala 1002
——— cephaloides 604, 1002
——— isota 1002
——— martini 1002
——— phiditia 1002
Scolopax rusticula 268, 633, 1087, 1217
Sclopendra 143, 144
Scops bakkamœna 167, 586, 1167, 1212
——— gin 631
Scotophilus 1321
——— belangeri 398
——— ceylonicus 397
——— coromandra 1179
——— flaveolus 398
——— fulvidus 1180
——— heathi 398
——— kuhli 398, 830, 1180, 1342, 1359
Scotophilus luteus 398
——— wroughtoni .. 398, 399, 1180
Scotozous dormeri 398
Scrophularia calycina 703

NUMBER.

Scrophularia lucida 205, 206
——— scabiosæfolia 206
——— variegata 206
Scuirus pernyi 1362
Scutellaria angulosa 704
——— grossa 704
Scutum ungius 637
Sebastonyma dolopia 604, 1002
Sedum linearifolium 703
——— trifidum 703
Segetia mandarina 888
——— sareptœ 888
Sehleichera trijuga 1297
Selenium vaginatum 703
Selinum candolii 1056
——— papyraceum 1056
——— tenuifolium 1056
——— vaginatum 1056
Semnopithecus anchises 397
——— dussumieri 1176
——— entellus 397
——— hypoleucos 1176
——— hypoleucus 1176
Seneca 1252
——— tumidella 1252
Senecio graciliflorus 704
Sephisa chandra 58, 558, 574
——— ——— albina 558, 574
——— ——— chandrana .. 558, 574
Serilophus rubripygius 1208
Serpens indica 2
Serranus 694
Serratula pallida 704
Sesamia 903
——— albiciliata 903
——— cretica 903
——— ——— striata 903
——— fraterna 903
——— inferens 903
——— pallida 903
——— striata 903
——— tranquillaris 903
——— uniformis 903, 904
——— vulteria 903
Sesamum indicum 207

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Sesbania aculeata	1038
Seseli sibiricum	1056
Seudyra	908
——— albifascia	909
——— bala	909
——— catocalina	908
——— dissimilis	909
——— longipennis	908
——— nepcha	909
——— transiens	908, 909
——— venosa	908
Seynesia grandis	1287
Sibia nigriceps	251
Sida carpinifolia	225
—— cordifolia	225
—— grewloides	211
—— humilis	224
—— rhombifolia	225, 698
—— spinosa	224
Silene griffithii	704
——— tenuis	704
Silybura ocellata	280
Simia	392, 1191
—— entellus	397
—— sinica	1176
Simotes	280
Simyra	428
——— albicosta	428
——— albovenosa	428
——— confusa	428, 429
——— conspersa	428, 429
Sinthusa chandrana	994
——— nasaka	994
——— amba	994
——— virgo	603, 994
Siphia albicilla	672, 1203
——— hyperythra	546
——— parva	155, 546, 1165
Sisyimbrium alliaria	703
——— wallichii	703
Sithon nedymond	996
Sitta castaneiventris	90, 1165
—— frontalis	90, 671, 1200
—— kashmiriensis	545
—— nagaensis	625
Sitta neglecta	625, 1200
Sium latijugum	1055
Skimmia laureola	702
Smithia ciliata	705, 1045
——— geminiflora	1045
——— sensitiva	1045
Solanum dulcamara	704
——— nigrum	704
——— pensile	1364
Solenophorus negacephalus	472
Sonchus oleraceus	703
Sopubia trifida	705
Sorex melanodon	847
—— nigra	1182
—— nudipes	847
—— perrotteti	847
Spælotis uniformis	431
Spalgis epius	981
——— ——— nubilus	981
Spatula clypeata	159, 181, 1088, 1221
Spatulipalpia albirostalis	1256
——— albistrialis	1256
Sphærella bhauria	1295
——— bœhmeriæ	1296
Sphæria albicans	1299
——— apiospora	1292
——— bambusæ	1295, 1296
——— cayennensis	1297
——— confluens	1299
——— constellatio	1297
——— demersa	1290
——— deusta	1301
——— lineata	1299
——— nepalensis	1298
——— ochracea	1292
——— ordinata	1299
——— pandani	1295
——— spiculosa robiniæ	1298
——— versipellis	1301
Sphærostilbe gracilipes	1294
Sphærotheca pannosa	1284
Sphecoidea	477
Sphenocercus apiccauda	674
——— sphenurus	631, 674
Sphetta	901

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Sphetta apicalis 901
Sphex rybiensis 800
Sphragifera 906
——— sigillata 906
Spilonota æstuosa 854
——— algosa 854
——— babylonica 854
——— caleata 853
——— melanacta 853
——— meleanocopa 853
——— rhothia 853
Spilornis cheela .. 1162, 1167, 1213
Spiræa aruncus 1052, 1059
——— ulmarsa 228
——— vestita 228, 702
Spizaëtus cirrhatus .. 99, 167, 1167
——— limnaëtus 586, 1213
Spizixus canifrons 625
Spodoptera 431
——— abyssinia 431
——— acronyctoides 433
——— cilium 431
——— erica 431
——— insula 432
——— mauritia 431, 433
——— pecten 431
——— postfusca 433
Sporæginthus amandava 93, 165, 1166
——— flavidiventris 1205
Squatarola helvetica 1217
Stachyrhis nigriceps 1199
Staphidia strata .. 266, 301, 670
Staphylea emodi 702
Statherotis decorata 870
Stauropus chlorotricha 1271
Stellaria paniculata 704
Stemmatophora ædalis 1260
Stephanoceras 1349
——— diadematum .. 1349, 1352
——— fissum 714, 1352
——— macrocephalum 714, 1352
——— maya 714, 1352
——— opis 1349
——— polyphemus. 714, 1349, 1351
——— semilæve 1352

NUMBER.

Stephanoceras subtumnidum 1352
——— transiens 714
——— tumidum. 714, 1349, 1351
Stereum annosum 148
——— elegans 147
——— hirsutum 147
——— lobatum 147
Sterna bergii 1218
——— fuliginosa 684
——— media 301
——— melanogaster 102, 168
——— minuta 170
——— scena 168, 1218
Stibochiona nicea 58, 574
——— ——— subucula 574
Stiboges nymphidia 969
Stictopthalma camadeva 571
——— ——— camadevoides 571
——— ——— nicevillei .. 571
——— howqua sparta .. 571
——— louisa 571
——— nourmahal 571
——— nurinissa 571
Stictospiza formosa .. 93, 165, 1166
Stimula swinhoei 1003
Stoparola melanops .. 161, 628, 672
Strepsicrates 853
Strepsilas interpres 1217
Strix flammea 98 1360
Strobilanthes glutinosus 705
Sturma nemoricola 672
Sturnia malabarica 1202
Sturnopastor contra 92, 161, 1165, 1203
——— superciliaris 1203
Sturnus menzbieri 155, 1165
——— porphyronotus 617
Stygiathetis 446
——— mus 446
Suada swerga 604, 1001
Suastus aditus 1001, 1002
——— bipunctus 1001
——— divodasa 1001
——— gremius 1001, 1002
——— lisides 996
——— minuta 1001

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Suastus ratika 1001
——— robsonii 1001
——— sala 1001
——— sinhalus 1001
——— subgrisea 1001
Subemarginula 638
Succinea 707
Sula cyanops .. 272, 273, 1334, 1362
Surendra amisena 990
——— biplagiata 990
——— florimel 990
——— quercetorum 597, 990
——— ——— discalis 990
——— stimula 990
——— tatimargo 990
Sus affinis 1194
— bengalensis 1194
— cristatus 1194, 1195, 1359
— indicus 237, 1194
— scrofa 1195
Suya khasiana 627
—— superciliaris 671
Sylepta adductalis 1268
——— agraphalis 1267
——— denticulata 1267
——— microsema 1268
——— ovialis 1268
——— pseudovialis 1268
Sylvia affinis 160
——— jerdoni 160
Sylviparus modestus 169
Symbrenthia brabira 580
——— cotanda 62
——— hippoclus lucina 580
——— hypselis 62
——— ——— cotanda 580
——— ——— sinis 580
——— khasiana 580
——— lucina 62
——— niphanda 62, 580
——— ——— silana 580
——— sivokana 580
Symphædra khasiana 58
Symplocos 1287, 1289
——— spicata 1287, 1295

NUMBER.

Synchloë 1131, 1135, 1145
——— lucilla 1135
Synegia conflagrata 1243
Synhamitermes n. subg. 792
Syntermes 783, 792
Sypheotides aurita 722
——— bengalensis 1109
Sypheotis 21, 721
——— aurita .. 101, 168, 721, 722, 723, 727, 732, 737, 1127
——— bengalensis .. 721, 722, 737, 1109, 1128, 1360
Syrhaptes tibetanus 179, 181
Syrnium biddulphi 1313
——— indrani 1362
——— ocellatum 98, 166

Taccocua leschenaulti 97, 166
Tachornis infumatus 1210
Tadorna cornuta .. 181, 274, 1089, 1220
Tagiades alica 999
——— athos 999
——— atticus 603, 999
——— calligana 999
——— dealbeata 999
——— distans 999
——— gana 999
——— helferi 999
——— ——— ravi 999
——— khasiana 603
——— lavata 999
——— litigiosa 999
——— meetana 999
——— menaka 603, 999
——— menanto 999
——— nana 999
——— noctis 999
——— obscurus 999
——— pinwilli 999
——— pralaya 999
——— tabrica 999
——— trichoneura 999
Tajuria illurjis 600

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	Number.
Tajuria maculatus	600
——— (Cophanta) illurgi	995
——— (———) illurgoides	995
——— (Cophanta) jalindra indra ..	995
——— (———) ——— tarpina ..	995
——— (———) luculenta	995
——— (———) maculatus	995
——— (Remelana) donatana	995
——— (———) istroidea	995
——— (———) jangala	995
——— (———) ——— andamanica.	995
——— (———) ——— ravata ..	995
——— (———) mantra	995
——— (———) megistia	995
——— (———) teza	995
——— (———) thria	995
——— (———) yajna	995
——— (Tajuria) albiplaga	995
——— (———) cippus	995
——— (———) diaeus	995
——— (———) jehana	995
——— (———) longinus	995
——— (———) nela	995
——— (———) thyia	995
——— (———) tyro	995
Talicada khasia	594, 985
——— nyseus	594, 985
——— ——— khasiana	985
Talliera bengalensis	70
——— taleti	70
Tamarindus indica ..	942, 1299, 1302
Tamarix gallica	1292
Tapena hampsoni	998
——— minuscula	998
——— thwaitesi	998
Taphozous	1321
——— bicolor	399
——— kachhensis ..	229, 395, 399, 831
——— melanopogon.	229, 399, 822, 830, 846
——— theobaldi	847
Tapinostola procera	900
Taractrocera archias	1001
——— atropunctata	1001

	Number.
Taractrocera ceramas	1001
——— ——— nicevillei ..	1001
——— ——— oberthuri ..	1001
——— coras	1001
——— danna	1001
——— dara	1001
——— luzonensis	1001
——— mæoides	1001
——— maevius	1001
——— silhetica	1001
——— ziclea	1001
Taraka hamada	593, 982
Taraxacum officinale	703
Tarucus plinius	596, 985
——— theophrastus	288, 985
——— ——— venosus ..	985
Tatache albonotata	444
——— plumbicula	444
Tatera	1183, 1191
——— indica	404, 823, 849, 1187
Taverniera nummularia	1034
Taxila burnii	584
——— haquinus fasciata	584
——— thuisto	584
Teinopalpus imperialis	588, 974
——— ——— himalaicus ..	974
——— ——— imperatrix ..	974
Telchinia violæ	584
Telicota bambusæ	605
——— dara	605
——— maesoides	605
——— (Padraona) akar	1004
——— (———) alfurus	1004
——— (———) concinna ..	1004
——— (———) dara	1004
——— (———) fabriolata ..	1004
——— (———) flava	1004
——— (———) gola	1004
——— (———) goloides	1004
——— (———) hataerus ..	1004
——— (———) locus	1004
——— (———) mæsa	1004
——— (———) mæsoides ..	1004
——— (———) nala	1004
——— (———) nitida	1004

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

Telicota (Padraona) pseudomæsa .. 1004
——— (———) rectifasciata .. 1004
——— (———) sunias 1004
Telicota (———) taxilus 1004
——— (———) trachala 1004
——— (———) zatilla 1004
——— (———) zebra 1004
——— (Telicota) augias 1004
——— (———) bambusæ 1004
——— (———) chrysozona 1004
——— (———) palmarum 1004
——— (———) pythias 1004
Temenuchus pagodarum 92, 165, 1165
Termitoxenia assmuthi 780
——— heimi 786
Tephrodornis pelvicus 672
——— pondicerianus .. 91, 164, 680, 1165, 1202
Tephrosia pauciflora 1037
——— purpurea 1037
——— villosa 1037
Terias .. 1133, 1138, 1141, 1142, 1143, 1144, 1145
——— hecabe 593, 1138, 1146
——— læta 593, 1138, 1142
——— libythea 592, 1138
——— silhetana 593, 1138
——— venata 592. 1138
——— (Gandaca) harina andamana .. 980
——— (———) ——— assamica .. 980
——— (———) ——— burmana .. 980
——— (Kibreeta) libythea 980
——— (———) ——— fruhstorferi. 980
——— (Nirmula) leata 980
——— (———) ——— pseudelacta .. 980
——— (———) venata 980
——— (———) ——— rama .. 980
——— (———) ——— sikkimica .. 980
——— (Terias) andersoni 980
——— (———) blanda 980
——— (———) hecabe 557, 558, 980
——— (———) sari 980
——— (———) ——— sodalis 980
——— (———) silhetana 980
Terinos clarissa 581

NUMBER.

Termes estherae 775
——— obesus 779, 780, 781
Terminalia 1287
——— catappa 1285, 1292
Terpsiphone affinis 1203
——— paradisi .. 92, 162, 617, 660, 1165
Tetraceros iodes 825
——— paccerois 825
——— quadricornis 825, 1194
Tetraogallus tibetanus 178, 181
Tetrax 21
——— tetrax 21, 38
Tetrogallus himalayensis 1084
Thaduka multicaudata 999
Thalatha 423
——— conjecturalis 423
——— sinens 423
Thalictrum cultratum 1058
——— foliolosum 1059
——— javanicum 1059
——— pedunculatum 703
——— reniforme 1059
Thamala 993
——— miniata 996
Thamnobia cambaiensis .. 93, 165, 1165
Thanaos marloyi 1000
Tharralæus jerdoni 550
Tharrhæleus atrigularis 262
Thaumantis diores 54, 571
——— lucipor 571
Thauria aliris intermedia 571
——— pseudaliris 571
Thecla sassanides 989
Thereiceryx lineatus, ... 1209
——— zeylonicus .. 95, 1166
Thermopsis barbata 703, 1030
Thermopteryx, gen. nov. 1254
——— rubrifusa 1254
Theron nepalensis 1214
Thielavia basicola 1288
Thisizima 126
——— bubalopa 125
Thriponax feddeni .. 1081, 1085, 1086
Thymus serpyllum 703

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NUMBER.

...ima huebireri 54
—— lycus 53
—— methora 53
—— newara 53
—— (Kolasa) chanui 564
—— (——) ypthimsides .. 564
—— (Wadira) bolanica 564
—— (Pandima) asterope mahratta 565
—— (——) inica 565
—— (——) lycus 565
—— (——) —— lycoides .. 565
—— (——) nareda 565
—— (——) newara 565
—— (——) —— sarcoposa.. 565
—— (——) watsoni 565
—— (Shania) megalia 564
—— (Thymipa) affectata 565
—— (——) avanta 565
—— (——) —— cerealis .. 565
—— (——) —— singala .. 565
—— (——) —— strinta .. 565
—— (——) baldus 565
—— (——) doherty 565
—— (——) matinia 565
—— (——) methora 565
—— (——) —— persimilis. 565
—— (——) philomela .. 565
—— (——) —— indecora 565
—— (——) sakra 565
—— (——) —— austena .. 565
—— (——) —— nikæa .. 565
—— —— vara 565
—— (——) similis 565
—— (——) sobrina 565
—— (——) tabella 565
—— (——na) ceylonica 557, 564, 565
—— (——) hubneri .. 557, 564
—— (——) —— kashmira .. 564
—— (——) iarba 564

...ia 908
...tus 1108

NUMBER.

Zamenis diadema .. 134, 138, 301, 474
—— korros 134
—— mucosus .. 134, 452, 690, 1099
—— ravergieri 137, 138
—— rhodorhachis .. 134, 135, 136
—— —— ladacensis 134, 135, 136
—— ventrimaculatus .. 134, 135
Zanthoxylum rhetsa .. 521, 531, 747
Zarona jasoda 987
—— zanella 987
Zea mythecoides 1003
—— taprobanis 1003
Zeltus etolus 602, 996
Zemeras flegyas 65, 584
—— —— confucius 584
Zephyrus sp. 598
—— ataxus 988
—— birupa 968
—— dohertyi 988
—— duma 598, 988
—— icana 988
—— khasia 988
—— letha 988
—— pava 988
—— syla 988
—— triloka 988
—— ziha 988
—— zoa 988
Zesius chrysomallus 993
Zeuxidia amethystus masoni 571
—— doubledayi 571
Zinaspa todara 990
—— —— distorta 990
Zipœtis saites 565
—— scylax 53, 566
Zizera gaika 984
—— lysimon 594, 984
—— (——) karsandra 984
—— maha 594, 984
—— —— opalina 984
—— —— ossa 984
—— marginata 984
—— otis 594, 984
—— —— indica 984

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

	NUMBER.
Zizera zera	984
Zizyphus jujuba	310, 1298
Zographe[illegible] flavalum	1002
——— [illegible]pennis	1002
——— ma[illegible]ornis	1002
——— ogyg[illegible]	1002
Zographetus [illegible]wa	[illegible]
Zoothera monticola	6[illegible]
Zornia bifnylla	10[illegible]
Zosimia absinthifolia	10[illegible]
Zosterops plapebrosa	90, 164, 116
——— simplex	67

पुस्तकालय
गुरुकुल कांगड़ी विश्वविद्यालय
हरिद्वार

पुस्तकालय
7954
गुरुकुल कांगड़ी विश्वविद्यालय हरिद्वार

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Compiled
1999-2000

सन्दर्भ ग्रन्थ
REFRENCE BOOK

यह पुस्तक वितरित न की जाय
NOT TO BE ISSUED

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Indira Gandhi National Centre for the Arts